# SBSP Affirmative- ARL Lab- NDI 2011

### Brought to you by Adam, Debnil, Julian, Olivia, Shaun, and Taemin

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# Plan

### The United States Federal Government should develop and deploy space based solar power as soon as possible.

## 1AC Oil Advantage (First Draft)

### Advantage \_\_\_: Oil Dependence-

### Oil consumption is increasing while supplies are decreasing- we are already past the peak.

Kohl ’11 (Keith, Editor-in-chief of *Energy and Capital*. “Peak Oil: Tighter Supply Ahead” http://www.energyandcapital.com/articles/peak-oil-supply/1642. July 13, 2011) AP

There seems to be a debate about Peak Oil around every corner. It isn't the dispute itself that irks us. Rather, that people look at the developing situation and still refuse to accept the facts. Some of the reasons not to worry are downright laughable, including one I just got wind of that involved oil fields magically replenishing themselves once depleted. The real offenders are the ones who have no idea how tight the world's oil supply will become over the next few years. They firmly believe a global peak in oil production is decades away. I hate to be the one to tell these folks the peak may already be behind us... Tighter World Supply For how long will the Saudis be able to bail out global production? Depending on who you're talking to, the Saudis have between two and four million barrels per day in spare capacity. In other words, the country can officially increase its oil production to more than 11 million barrels per day, if necessary. Whether they will actually tap into that spare capacity or not is another matter. And there are other problems with this oil they're saving for a rainy day. No matter how optimistic the Saudis are about their spare capacity, the fact is this isn't the same light, sweet crude that makes our refineries drool. The only oil available is the sour crude that's more difficult to refine. How can we be so sure of that? We've already seen this movie. With nearly two million barrels per day of Libyan crude shut-in, the Saudis have been saying for months they would be willing to help ease that burden by producing more. They've already reported the majority of their spare capacity comes from oil with higher sulfur content. But many of the European and Asian refineries can't handle this grade of sour crude. Keep in mind the Saudis are one of the few oil producers with membership to a rare club. Less than fifteen of the world's oil-producing countries have not peaked — yet. Pandora's Oil Box By now, we've all heard about the IEA's decision to release 60 million barrels of oil from various strategic petroleum reserves around the world, coming mostly from China and the United States. Despite drawing anger from the OPEC, the IEA is setting itself up for another predicament further down the line. The IEA already stated this SPR release is only intended to “help bridge the gap until sufficient oil” is found. And that begs the question of whether or not we'll ever be able to sufficiently produce enough oil... According to the IEA's latest oil report, global oil demand is expected to rise to 89.5 million barrels per day (about 1.2 million barrels per day compared to 2010) within the next six months. By 2012, world oil consumption is expected to climb another 1.5 million bbls/d to 91 million barrels per day. The Energy Bull You Don't Want to Miss Meanwhile, production won't come anywhere close to that number. Global production is only expected to reach ~89 million barrels per day. Just so we're clear with things, this SPR release was a one-time deal intended to bridge the gap until more oil is available... Yet, supply will still be short? Is this just an exercise in futility? At this point, a better question to ask yourself might be if you're prepared for Peak Oil. Flirting with Disaster Let's look a little closer to home. We've all seen the nightmare-inducing chart showing the peak in our domestic oil production. If you really want to know when we began flirting with disaster, it was actually two decades before our peak. U.S. oil production hasn't been self-sustaining since the 1950s, and the gap has been widening ever since. Not to spoil the hopes and dreams of every alternative to oil, natural gas, and coal... But are we really surprised by how we are meeting that demand? And just like the sour grade of the Saudis' spare capacity, tomorrow's oil won't be the same as today's variety. That's one of the reasons light oil plays are so valuable to today's investors.

### High oil prices make SBSP economically competitive.

NSS ’07 (National Space Society, “Report to the Director, National Security Space Office Interim Assessment” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf. October 10, 2007)

Oil prices have increased from less than $15US per barrel during 1999 to over $80 US per barrel today (2007). The higher oil prices go, the more viable becomes the business case for Scenario 2 ‐ SBSP as an alternative source of energy. Price though is not the only concern. The stability and security of the flow of oil into the United States is also very important. While Canada is America’s largest supplier, much of the rest of her imported oil comes from the unstable regions of the Middle East or unstable countries such as Nigeria or unfriendly ones such as Venezuela. Energy security and continued supply are serious concerns. Oil supplies may not run out in our lifetimes but we must plan for future generations. Supplies are being consumed at a higher rate than new reserves are being discovered. Demand has dramatically increased from emerging countries such as China and India, along with the slow steady increases from Western economies. Decreasing supply or increasing demand can each C - 2 lead to higher prices. With both forces acting together, higher prices are expected to continue and accelerate. Coal and natural gas, which are primarily used for the generation of electricity, have also seen price increases in recent years though not to the degree that oil has increased. Since the source of these is primarily domestic, it is not subject to the same uncertainty premium that oil currently carries. Coal‐based electricity, using current emission controls, provides electricity at about 5 cents per kWh (busbar cost). The primary challenge to this is global warming, which may force new plants (and retrofits at existing plants) to capture CO2 for sequestration. Carbon capture and sequestration technologies and systems are expected to add at least a few cents per kWh.

### SBSP solves oil dependence- solves 100% of global energy demand

Morgan ’07 (James, staff writer for Herald Scotland. “Ray of Hope on Energy”http://www.heraldscotland.com/ray-of-hope-on-energy-1.840720. 25 Oct 2007) AP

If I told you that the US military has just unveiled plans to fire a beam of high-energy microwaves to Earth from space, you might well hide under your bed. But this is no "death ray". In fact, it's not even a weapon. It's a formula for world peace and the end of climate change. Now I know what you're thinking. "Hang on, I know what the US military really means when they talk about bringing peace' to the world." True, I admit that if you were hoping to save the planet, the Pentagon might not be the first door you would knock on. So it comes as a pleasant surprise that, from the offices of the US Department of Defense, an elegant and inspiring blueprint for peace on Earth has emerged, in the form of a giant microwave beam. Ever since the Sputnik satellite was launched 50 years ago, scientists have dreamed of building "orbiting power stations", by launching acres of solar panels and beaming electricity back to Earth. Putting "solar factories" in space would allow them to operate 24 hours a day, offering a consistent, limitless supply of green energy. These dreams were always shot down by the costs - exorbitant when compared with the plentiful reserves of fossil fuels. Now, with spiraling oil prices and the threat of runaway climate change, the balance has tipped, according to the National Security Space Office, part of the Department of Defense. Its study claims that space-based solar power (SBSP) could be economically competitive in the near future. In just a year, it calculates, satellites orbiting in a continuous sunlight could generate energy nearly equivalent to all of the energy available in the world's oil reserves. Not only might that put the brakes on global warming, it says, it could help to stifle the wars and political tension that the oil trade creates. The result - a peaceful world. "This is a solution for mankind," said former astronaut Buzz Aldrin, chairman of the spaceflight advocacy group, ShareSpace Foundation, at the unveiling of the report in Washington. The report urges the US government to invest £5bn in a pilot project, to spur private investment in the concept. It argues that SBSP could generate so much power it could transform the gas guzzling United States into an energy-exporting nation. The power plant would beam its energy in a microwave beam, which would hit a receiving antenna complex, known as a "rectenna", which would convert it into electricity. But the platforms would be much larger than anything yet constructed in space - requiring an enormous growth and advancement in space transport. Then there's the timescale. It would take at least 10 years before energy could be produced in significant quantities. Finally, what about the possibility that the beam could be attacked, captured and used as a weapon? Ah well, say the authors, this is the clever part. If the US invites other space powers to get involved, they'd have no reason to object. Clean energy for everyone and not a sniff of a war anywhere. Bring on the death rays, I say.

### SSP can quickly eliminate this dependence

Mick 7 (Jason, senior news editor at independent tech news site DailyTech, “The Pentagon Wants Space Solar Power for U.S., Allies”, 10-15-07, http://www.dailytech.com/The+Pentagon+Wants+Space+Solar +Power+for+US+Allies/article9275.htm) OP

The Pentagon seeks to eliminate U.S. dependence on foreign oil, including imports that come from the conflict laden Middle East -- something which it sees as a critical "strategic energy vulnerability." In order to eliminate this dependence, it proposes a radical alternative energy strategy. The Pentagon's National Security Space Office (NSSO) proposed collecting solar rays in space and beaming it back to Earth. It stated in the report that it feels that this is a "near-term" solution, which could be realized very quickly. Such a move it says in the report, would allow U.S. forces deployed around the world to eliminate the long logistic chain needed to deliver fuel to vehicles and other generators, by beaming power directly where needed. The NSSO labels the technology Space Solar Power (SSP) and has issued a press release (PDF) on a blog it is publishing with the Space Frontier Foundation. The plan also states that by developing SSP, the U.S. Armed Forces can reduce the risk for large scale commercial development of the technology. What this means, if the plans succeeds, is that industries may eventually see the technology at an affordable price, while the military will pay a premium to become the early adopter. "The business case still doesn't close, but it's closer than ever," Marine Corps Lt. Col. Paul E. Damphousse of the NSSO states in the report. Charles Miller, CEO of Constellation Services International, a space technology start-up, and director of the Space Frontier Foundation, hopes that the government chooses to follow the report and adopt the technology. By installing a power plant in geostationary orbit, the government can effectively "buy down" the risk for industry start-ups such as his company, he says. Such a move could allow the U.S. and its allies to commercially eliminate oil dependence, and meet the energy needs of the developing world, ushering in an era of clean energy. John Mankins, president of the Space Power Association and technical expert in the field of SSP, had this to say on the proposal, "This is not a 50-year solution--the kinds of things that are possible today say a truly transformational demonstration at a large scale is achievable within this decade."

### SBSP can replace all forms of fossil fuels.

NSS ’07 (National Space Society, “Report to the Director, National Security Space Office Interim Assessment” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf. October 10, 2007)

The SBSP Study Group found that in the long run, SBSP offers a viable and attractive route to decrease mankind’s reliance on fossil fuels, as well as provides a potential global alternative to wider proliferation of nuclear materials that will almost certainly unfold if many more countries in the world transition to nuclear power with enrichment in an effort to meet their energy needs with carbon neutral sources.

To the extent mankind’s electricity is produced by fossil fuel sources, SBSP offers a capability over time to reduce the rate at which humanity consumes the planet’s finite fossil hydrocarbon resources. While presently hard to store, electricity is easy to transport, and is highly efficient in conversion to both mechanical and thermal energy. Except for the aviation transportation infrastructure, virtually all of America’s energy could eventually be delivered and consumed as electricity. Even in ground transportation, a movement toward plug‐in hybrids would allow a substantial amount of traditional ground transportation to be powered by SBSP electricity.

For those applications that favor or rely upon liquid hydrocarbon fuels, America’s national labs are pursuing several promising avenues of research to manufacture carbon‐neutral synthetic fuels (synfuels) from direct solar thermal energy or radiated/electrical SBSP. The lab initiatives are developing technologies to efficiently split energy‐neutral feedstocks or upgrade lower‐grade fuels (such as biofuels) into higher energy density liquid hydrocarbons. Put plainly, SBSP could be utilized to split hydrogen from water and the carbon monoxide (syngas) from carbon dioxide which can then be combined to manufacture any desired hydrocarbon fuel, including gasoline, diesel, kerosene and jet fuel. This technology is still in its infancy, and significant investment will be required to bring this technology to a high level of technical readiness and meet economic and efficiency goals.

This technology enables a carbon‐neutral (closed carbon‐cycle) hydrocarbon economy driven by clean renewable sources of power, which can utilize the existing global fuel infrastructure without modification. This opportunity is of particular interest to traditional oil companies. The ability to use renewable energy to serve as the energy feedstock for existing fuels, in a carbon neutral cycle, is a “total game changer” that deserves significant attention.

### We’ll isolate three scenarios:

### Scenario One- Economy Collapse

### Oil dependence is dragging the economy into deeper recession- collapse inevitable

Alden ’11 (William, business reporter for The Huffington Post. He has also written for the New York Observer and the New York Press and is a graduate of Yale University. “Analyst: Rising Oil Prices 'Primary Threat' To U.S. Economy As Libyan Violence Mounts” http://www.huffingtonpost.com/2011/03/21/libya-conflict-oil-prices\_n\_838624.html. 03/21/11) AP

NEW YORK -- As international military forces strike Libya, oil prices are again rising, reviving concerns that expensive energy could impede economic recovery in the United States. U.S. consumers and businesses got a brief reprieve this month as oil prices eased off two-and-a-half-year highs. But escalating violence in Libya and rising tensions among the Middle East's oil-producing powers have raised fresh fears of a supply disruption. With investors nervous, benchmark crude prices are again rising, threatening a broader recovery that had barely begun to gather momentum. "A spike in energy prices to $125 or $150 a barrel is the primary threat to the recovery at this point, now that it appears the situation in Japan has settled down somewhat," said Gus Faucher, director of macroeconomics at Moody's Analytics. "This could play out over a period of weeks and months." Those prices continue to roil in the wake of Mideast unrest, including the Western intervention in Libya that began this weekend on behalf of rebels opposing longtime head of state Muammar Gaddafi. In Yemen, meanwhile, scores of demonstrators were killed on Friday, prompting the country's U.N. ambassador to resign. And tension between two of the region's major powers, Iran and Saudi Arabia, appears to be mounting in Bahrain. Already, Libya's crude oil output has fallen to a quarter of its pre-crisis level, as multinational oil producers have been taking workers out of the country. That output, which makes up 2 percent of the world's oil, could fall to zero, said Shokri Ghanem, chairman of Libya's National Oil Corporation, during a televised media conference last week. These are among the key developments that have sent oil skyward. Since last Tuesday, when prices hit their recent bottom, the price of Brent crude, an industry benchmark, has climbed nearly 7 percent. Since the beginning of this year, Brent has climbed more than 20 percent. The price fell after an earthquake struck Japan's northeast coast earlier this month, but it has since rebounded, clearing $116 a barrel on Friday. Oil has hit a level not seen since 2008, when high energy prices helped drag the U.S. economy deeper into recession. And now the price is again on the rise. "If prices come back down after a short while, the impact on the U.S. economy is relatively limited," said Gregory Daco, a senior economist in the U.S. macroeconomics group at IHS Global Insight, an economic and financial analysis firm. "However, if prices do stay at a higher level for six months to a year, the impact on growth can be relatively important." High energy prices have forced businesses to delay hiring plans and to consider passing fees onto customers. Rising prices at the pump have sapped spending power from consumers, crippling a major source of U.S. economic growth. Expensive oil even threatens the housing market's recovery, as the prospect of a costly commute makes moving to the suburbs less attractive. Each $10 rise in the price of a barrel of oil translates into a 25-cent increase in gas prices, which tears more than $25 billion from the U.S. economy yearly, economists say. The economic risk posed to the United States by rising oil prices eclipses the effects of the disaster in Japan, experts say. The 9.0-magnitude earthquake that stuck Japan this month, which could plunge that country into recession, won't pose a major risk to the U.S. economy, economists say, as companies will find ways to work around supply disruptions. But high energy prices drain resources from consumers and businesses, crippling the nation's economic foundations. "Oil prices are even more of a concern to the U.S. outlook than what's going on in Japan right now," said Scott Anderson, a senior economist at Wells Fargo. "The consumer is still working to recover form the excesses of the financial crisis." The oil supply disruption that's already occurred is relatively minor, and the Organization of Petroleum Exporting Countries has pledged to correct any shortage with its oil reserves. But the price of a barrel of oil reflects the perception of a mounting crisis. Even without a significant shortage, that perception is helping to cause real economic damage. As fighting continues in the Middle East, investors fear the damage to the global oil trade could worsen. Experts are keeping a close eye on Saudi Arabia, which has sent to troops to Bahrain to help quell anti-government actions. Tensions between Saudi Arabia and Iran, which each support rival groups in Bahrain, could turn into outright conflict, experts fear. Combined, Saudi Arabia and Iran produce more than 17 percent of the world's oil. An oil supply disruption in Saudi Arabia could inflict widespread economic strain. "Whats starting to bubble up to the surface here is this major clash between Saudi Arabia and Iran," said Bernard Baumohl, the chief global economist at the Economic Outlook Group. "That can have much more dire consequences for the global economy."

### Oil dependence collapses economy – high oil prices, trade deficits, consumer spending

Zubrin ’11 (Robert, president of Pioneer Astronautics and author of “Energy Victory: Winning the War on Terror by Breaking Free of Oil”. “Rising oil prices threaten economic crash” http://www.washingtontimes.com/news/2011/mar/17/rising-oil-prices-threaten-economic-crash/?page=1. March 17, 2011)

In recent days, oil prices have climbed above $100 per barrel. As chaos spreads through the Arab world, we could soon see much worse. According to recent testimony given to Congress by Federal Reserve Chairman Ben S. Bernanke, the current soaring oil prices are no reason for concern. According to the stock market, which has dropped hundreds of points each time oil prices have edged up another dollar or two, the situation is a five-alarm emergency. Who is right? The likely impact of a new oil-price rise is shown in the graph below, which compares oil prices (adjusted for inflation to 2010 dollars) to the U.S. unemployment rate from 1970 to the present. It can be seen that every oil-price increase for the past four decades, including those in 1973, 1979, 1991, 2001 and 2008, was followed shortly afterward by a sharp rise in American unemployment. The distress to American workers caused by such events is manifest, but the economic damage goes far beyond the impact on the unemployed. A sustained oil price of $100 per barrel will add $520 billion to the U.S. balance-of-trade deficit. Furthermore, there is a direct and well-established relationship between unemployment rates and the rates of mortgage defaults. Thus, the $130-per-barrel oil shock of 2008 didn’t just throw 5 million Americans out of work, it made many of them default on their home payments and thus destroyed the value of the mortgage-backed securities held by America’s banks. This, in turn, threatened a general collapse of the financial system, with a bailout bill for $800 billion sent to the taxpayers as a result. But that is not all. The destruction of spending power of the unemployed and the draining of funds from everyone else to meet the direct and indirect costs of high oil prices reduce consumer demand for products of every type, thereby wrecking retail sales and the industries that depend upon them. Indeed, the world today is already in deep recession. Yet as a result of the systematic constriction of oil production by the Organization of Petroleum Exporting Countries (OPEC), which is limiting its production rate to 1973 levels of 30 million barrels per day, petroleum prices stand at more than four times what they were in 2003. This has imposed a tax increase on our economy of $500 billion per year, equal in economic burden to a 20 percent increase in income taxes, except that instead of the cash going to Uncle Sam, it will go to Uncle Saud and his lesser brethren. These governments, however, are said to be our “friends.” As current events in the Middle East should make clear, there is every chance that someday - perhaps soon - we could wake up and find that the world’s oil is under new management, even less concerned with our well-being than the gang in charge today. This is a fundamental threat to the American economy. We need to take action to protect ourselves from it now, before it is too late. How can we do this? From looking at the data in the graph, it is clear that “cap-and-trade” plans or alternative methods of carbon or fuel taxation are not the answer. Indeed, by increasing the cost of energy even beyond those imposed by OPEC, they will only make the economic situation worse. The only way out of this mess is forcefully to expand production of liquid fuels from sources outside OPEC control, particularly our own. That means unleashing our own domestic oil supplies through expanded drilling and also opening our vehicle-fuel market in a serious way to alternative fuels, such as methanol, which can be made cheaply from coal, natural gas or biomass and used in flex-fuel cars. It may be too late already to stop the crash that will follow the current oil price run-up, but we still have to get started without further delay. Otherwise, while the crash itself will bring down world fuel demand and thus oil prices for a while, they will just rise once more when the economy begins to recover and slam us right back down again. And again. And again. The time for action is now.

Global economic crisis causes nuclear great-power war

Mead 9 – Walter Russell Mead, the Henry A. Kissinger Senior Fellow in U.S. Foreign Policy at the Council on Foreign Relations, 2-4, 2009, “Only Makes You Stronger,” The New Republic, http://www.tnr.com/politics/story.html?id=571cbbb9-2887-4d81-8542-92e83915f5f8&p=2

If current market turmoil seriously damaged the performance and prospects of India and China, the current crisis could join the Great Depression in the list of economic events that changed history, even if the recessions in the West are relatively short and mild. The United States should stand ready to assist Chinese and Indian financial authorities on an emergency basis--and work very hard to help both countries escape or at least weather any economic downturn. It may test the political will of the Obama administration, but the United States must avoid a protectionist response to the economic slowdown. U.S. moves to limit market access for Chinese and Indian producers could poison relations for years. For billions of people in nuclear-armed countries to emerge from this crisis believing either that the United States was indifferent to their well-being or that it had profited from their distress could damage U.S. foreign policy far more severely than any mistake made by George W. Bush. It's not just the great powers whose trajectories have been affected by the crash. Lesser powers like Saudi Arabia and Iran also face new constraints. The crisis has strengthened the U.S. position in the Middle East as falling oil prices reduce Iranian influence and increase the dependence of the oil sheikdoms on U.S. protection. Success in Iraq--however late, however undeserved, however limited--had already improved the Obama administration's prospects for addressing regional crises. Now, the collapse in oil prices has put the Iranian regime on the defensive. The annual inflation rate rose above 29 percent last September, up from about 17 percent in 2007, according to Iran's Bank Markazi. Economists forecast that Iran's real GDP growth will drop markedly in the coming months as stagnating oil revenues and the continued global economic downturn force the government to rein in its expansionary fiscal policy. All this has weakened Ahmadinejad at home and Iran abroad. Iranian officials must balance the relative merits of support for allies like Hamas, Hezbollah, and Syria against domestic needs, while international sanctions and other diplomatic sticks have been made more painful and Western carrots (like trade opportunities) have become more attractive. Meanwhile, Saudi Arabia and other oil states have become more dependent on the United States for protection against Iran, and they have fewer resources to fund religious extremism as they use diminished oil revenues to support basic domestic spending and development goals. None of this makes the Middle East an easy target for U.S. diplomacy, but thanks in part to the economic crisis, the incoming administration has the chance to try some new ideas and to enter negotiations with Iran (and Syria) from a position of enhanced strength. Every crisis is different, but there seem to be reasons why, over time, financial crises on balance reinforce rather than undermine the world position of the leading capitalist countries. Since capitalism first emerged in early modern Europe, the ability to exploit the advantages of rapid economic development has been a key factor in international competition. Countries that can encourage--or at least allow and sustain--the change, dislocation, upheaval, and pain that capitalism often involves, while providing their tumultuous market societies with appropriate regulatory and legal frameworks, grow swiftly. They produce cutting-edge technologies that translate into military and economic power. They are able to invest in education, making their workforces ever more productive. They typically develop liberal political institutions and cultural norms that value, or at least tolerate, dissent and that allow people of different political and religious viewpoints to collaborate on a vast social project of modernization--and to maintain political stability in the face of accelerating social and economic change. The vast productive capacity of leading capitalist powers gives them the ability to project influence around the world and, to some degree, to remake the world to suit their own interests and preferences. This is what the United Kingdom and the United States have done in past centuries, and what other capitalist powers like France, Germany, and Japan have done to a lesser extent. In these countries, the social forces that support the idea of a competitive market economy within an appropriately liberal legal and political framework are relatively strong. But, in many other countries where capitalism rubs people the wrong way, this is not the case. On either side of the Atlantic, for example, the Latin world is often drawn to anti-capitalist movements and rulers on both the right and the left. Russia, too, has never really taken to capitalism and liberal society--whether during the time of the czars, the commissars, or the post-cold war leaders who so signally failed to build a stable, open system of liberal democratic capitalism even as many former Warsaw Pact nations were making rapid transitions. Partly as a result of these internal cultural pressures, and partly because, in much of the world, capitalism has appeared as an unwelcome interloper, imposed by foreign forces and shaped to fit foreign rather than domestic interests and preferences, many countries are only half-heartedly capitalist. When crisis strikes, they are quick to decide that capitalism is a failure and look for alternatives. So far, such half-hearted experiments not only have failed to work; they have left the societies that have tried them in a progressively worse position, farther behind the front-runners as time goes by. Argentina has lost ground to Chile; Russian development has fallen farther behind that of the Baltic states and Central Europe. Frequently, the crisis has weakened the power of the merchants, industrialists, financiers, and professionals who want to develop a liberal capitalist society integrated into the world. Crisis can also strengthen the hand of religious extremists, populist radicals, or authoritarian traditionalists who are determined to resist liberal capitalist society for a variety of reasons. Meanwhile, the companies and banks based in these societies are often less established and more vulnerable to the consequences of a financial crisis than more established firms in wealthier societies. As a result, developing countries and countries where capitalism has relatively recent and shallow roots tend to suffer greater economic and political damage when crisis strikes--as, inevitably, it does. And, consequently, financial crises often reinforce rather than challenge the global distribution of power and wealth. This may be happening yet again. None of which means that we can just sit back and enjoy the recession. History may suggest that financial crises actually help capitalist great powers maintain their leads--but it has other, less reassuring messages as well. If financial crises have been a normal part of life during the 300-year rise of the liberal capitalist system under the Anglophone powers, so has war. The wars of the League of Augsburg and the Spanish Succession; the Seven Years War; the American Revolution; the Napoleonic Wars; the two World Wars; the cold war: The list of wars is almost as long as the list of financial crises. Bad economic times can breed wars. Europe was a pretty peaceful place in 1928, but the Depression poisoned German public opinion and helped bring Adolf Hitler to power. If the current crisis turns into a depression, what rough beasts might start slouching toward Moscow, Karachi, Beijing, or New Delhi to be born? The United States may not, yet, decline, but, if we can't get the world economy back on track, we may still have to fight.

### And, Investing in clean energy reverses economic decline

### Lefton and Weiss 10 (Rebecca, Researcher for Progressive Media and Daniel J., Senior Fellow and Director Climate Strategy at the Center for American Progress., “Oil Dependence Is a Dangerous Habit”, 1-13-10, http://www.americanprogress.org/issues/2010/01/oil\_imports\_security.html) OP

The United States has an opportunity right now to reduce its dependence on foreign oil by adopting clean-energy and global warming pollution reduction policies that would spur economic recovery and long-term sustainable growth. With a struggling economy and record unemployment, we need that money invested here to enhance our economic competitiveness. Instead of sending money abroad for oil, investing in clean-energy technology innovation would boost growth and create jobs. Reducing oil imports through clean-energy reform would reduce money sent overseas for oil, keep more money at home for investments, and cut global warming pollution. A Center for American Progress analysis shows that the clean-energy provisions in the American Recovery and Reinvestment Act and ACES combined would generate approximately $150 billion per year in new clean-energy investments over the next decade. This government-induced spending will come primarily from the private sector, and the investments would create jobs and help reduce oil dependence. And by creating the conditions for a strong economic recovery, such as creating more finance for energy retrofits and energy-saving projects and establishing loans for manufacturing low-carbon products, we can give the United States the advantage in the clean-energy race. Investing in a clean-energy economy is the clear path toward re-establishing our economic stability and strengthening our national security.

### And, SBSP massively boosts economic growth.

NSS ’07 (National Space Society, “Report to the Director, National Security Space Office Interim Assessment” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf. October 10, 2007)

Finding: The SBSP Study Group found that SBSP appears to have significant growth potential in the long run, and a national investment in SBSP may return many times its value. Most of America’s spending in space does not provide any direct monetary revenue. SBSP, however, may create new markets and the need for new products that will provide many new, high‐paying technical jobs and net significant tax revenues. Great powers have historically succeeded by finding or inventing products and services not just to sell to themselves, but to others. Today, investments in space are measured in billions of dollars. The energy market is trillions of dollars, and there are many billions of people in the developing world that have yet to connect to the various global markets. Such a large export market could generate substantial new wealth for our nation and our world. Investments to mature SBSP are similarly likely to have significant economic spin‐offs, each with their own independent revenue stream, and open up or enable other new industries such as space industrial processes, space tourism, enhanced telecommunications, and use of off‐world resources. Not all of the returns may be obvious. SBSP is a both infrastructure and a global utility. Estimating the value of utilities is difficult since they benefit society as a whole more than any one user in particular—consider what the contribution to productivity and GDP are by imagining what the world would be like without electric lines, roads, railroads, fiber, or airports. Not all of the economic impact is immediately captured in direct SBSP jobs, but also in the services and products that spring up to support those workers and their communities. Historically such infrastructure projects have received significant government support, from land grants for railroads, to subsidized rural electrification, to development of atomic energy. While the initial‐capability on‐ramp may be slow, SBSP has the capability to be a very significant portion of the world energy portfolio by mid‐century and beyond.

### Scenario Two is Middle East War-

### America is becoming increasingly dependent on unstable, undemocratic Middle Eastern countries for oil NRDC 4 (Natural Resources Defense Council, “Reducing America's Energy Dependence”, 7-2-04, http://www.nrdc.org/air/transportation/gasprices.asp#head5) OP

America's oil habit not only pinches our pockets and fuels OPEC's rising profits, but it also threatens our economy, national security and environment. According to the Department of Energy, the United States currently uses nearly 20 million barrels of oil a day, importing 55 percent of it. We spend more than $20 billion each year on oil from the Middle East. Twenty years from now, U.S. consumption will rise to 28.3 million barrels of oil a day, with 70 percent of it imported. This heavy reliance on foreign oil makes America increasingly dependent on some of the least stable, undemocratic countries in the world.

### Reliance on such an unstable area impacts global economy, national security, and influences our politics towards the region Luft 08 (Gal, executive director of the Institute for the Analysis of Global Security (IAGS), “Dependence on Middle East Energy and its Impact on Global Security”, 6-2-08, http://www.thecuttingedgenews.com/index.php?article=537) OP

Conventional wisdom, concerned only with smooth functioning of the market, says that ownership of oil is meaningless, that it does not matter if most of the world’s oil is owned by one regime or the other. But in the case of the Middle East, resource ownership does matter. The region is riddled with deepening ethnic and political tensions, terrorism, corruption, and authoritarianism. In addition, there are problems that have no solution in sight and that will no doubt directly affect the supply of energy from the Middle East, among them a growing rift between Sunnis and Shiites, tension between the West and an increasingly radicalized Muslim world, increasing terrorist activity against oil facilities, protectionism, lack of investment, unresolved border disputes, and the growing uncertainty about the political stability of key energy producers like Saudi Arabia, Iran, and Iraq. The energy security and national security problems resulting from reliance on a single energy resource primarily located in such a volatile area are likely to be intensified as demand for oil grows. The region’s problems will no doubt impact not only the world’s economy and security but also consuming nations’ attitudes and policies toward the region’s producers, as well as toward each other.

### US war in Middle East over oil inevitable in squo - Carter Doctrine forces military intervention

Klare ’09 (Michael, professor of peace and world security studies at Hampshire College and the author of Resource Wars and Blood and Oil. “Repudiate the Carter Doctrine” http://www.fpif.org/articles/repudiate\_the\_carter\_doctrine. January 22, 2009) AP

Twenty-nine years ago, President Jimmy Carter adopted the radical and dangerous policy of using military force to ensure U.S. access to Middle Eastern oil. "Let our position be absolutely he clear," he said in his State of the Union address on January 23, 1980. "An attempt by any outside force to gain control of the Persian Gulf region [and thereby endanger the flow of oil] will be regarded as an assault on the vital interests of the United States of America, and such an assault will be repelled by any means necessary, including military force." This principle — known ever since as the Carter Doctrine — led to U.S. involvement in three major wars and now risks further military entanglement in the greater Gulf area. It's time to repudiate this doctrine and satisfy U.S. energy needs without reliance on military intervention. Focusing on the Gulf Carter enunciated his doctrine at a moment when U.S. officials were worried about the recent Islamic revolution in Iran and the concurrent Soviet invasion and occupation of Afghanistan. Both actions, it was believed, threatened the U.S. ability to ensure uninterrupted access to Persian Gulf oil. "The region which is now threatened by Soviet troops in Afghanistan is of great strategic importance," Carter said in his pivotal address. "It contains more than two-thirds of the world's exportable oil." Of particular concern: "The Soviet effort to dominate Afghanistan has brought Soviet military forces to within 300 miles of the Indian Ocean and close to the Straits of Hormuz, a waterway through which most of the world's oil must flow." Because the United States at that time did not possess any forces specifically earmarked for action in the Gulf, President Carter created a new military body, the Rapid Deployment Joint Task Force (RDJTF), to undertake operations in the region. He also expanded the U.S. naval presence in the Gulf and acquired new basing facilities in the wider region. Carter authorized covert operations in Afghanistan to drive the Soviets out of the country. This effort eventually involved U.S. support for Osama bin Laden and other Islamic extremists who now seek to make war on the United States. Although successive Republican leaders condemned many Carter policies, they warmly embraced the Carter Doctrine. Every Republican president since 1980 has invoked its basic principle to initiate war in the President Gulf region. The first to do so was Ronald Reagan during the Iran-Iraq War of 1980-88. When Iran began firing on Kuwaiti oil tankers (presumably because Kuwait had loaned money to Saddam Hussein), Reagan deemed the attacks a threat to the free flow of oil in accordance with the principles of the Carter Doctrine and ordered U.S. warships to protect the tankers. "Mark this point well," he declared on May 19, 1987. "The use of the sea lanes of the Persian Gulf will not be dictated by the Iranians." The U.S. decision to protect Kuwaiti tankers led to clashes with Iranian gunboats and thus amounted to U.S. involvement in the Iran-Iraq War as a de facto ally of Saddam Hussein. Faced with U.S. and Iraqi opposition, the Iranians were forced to sue for peace in 1988. To what degree this U.S. support led Hussein to believe he could then invade Kuwait with impunity is unknown. In any case, he seems to have expected a mild U.S. response from the invasion of Kuwait on August 2, 1990. This assumption, however, didn't take the Carter Doctrine into account. When President George H.W. Bush met with his advisers at Camp David on August 3 to consider the implications of the invasion they concluded, according to Bob Woodward of The Washington Post, that the Iraqi attack constituted a threat to the safety of Saudi oil and so would have to be repelled in accordance with the Carter policy. That the basic principles of the Carter Doctrine were in the forefront of Bush's mind when he initially committed U.S. forces to the Persian Gulf War is plainly evident from the first public address he gave on the topic, on August 8, 1990: "Our country now imports nearly half the oil it consumes and could face a major threat to its economic independence," he said. Hence, "the sovereign independence of Saudi Arabia is of vital interest to the United States." Bush later altered his rhetoric to emphasize weapons of mass destruction (WMD) and human rights, but oil was the starting point. As is well known, Bush Sr. chose not to invade Baghdad after driving Iraqi forces out of Kuwait but rather to seek Hussein's ouster through economic warfare. This led to the imposition of economic sanctions on Iraq — a policy also embraced by President Bill Clinton. Although justified in terms of undermining Hussein's ability to acquire WMD and other advanced military capabilities, the sanctions' ultimate goal was to eliminate a threat to the safety of Persian Gulf oil, in accordance with the Carter Doctrine. And when these measures failed to achieve the intended objective — at least in the eyes of President Bush Jr. — the only apparent alternative was direct U.S. military intervention. Like his father in the days leading up to Operation Desert Storm, George W. Bush avoided referring to oil and spoke solely of WMD and human rights when talking of the need to eliminate Saddam Hussein. But his vice president, Dick Cheney, wasn’t so reticent. In an August 2002 speech before the Veterans of Foreign Wars, he laid out the strategic reasons for attacking Iraq, saying: "Armed with an arsenal of [WMD] and a seat atop 10% of the world's oil reserves, Saddam Hussein could then be expected to seek domination of the entire Middle East, take control of a great portion of the world's energy supplies, [and] directly threaten America's friends throughout the region." As such, the current war in Iraq can best be viewed as part of a series of U.S. military moves taken in accordance with Carter's January 1980 pronouncement. Obama and the Carter Doctrine It would be enormously reassuring to conclude that the Iraq War is the last in this series, that the departure of President Bush and the arrival of President Obama signifies the end of U.S. involvement in Middle Eastern wars over oil. But there's no reason to assume that this is in fact the case. True, Obama has spoken repeatedly of his desire to withdraw U.S. combat troops from Iraq and to hasten the development of petroleum alternatives so as to reduce U.S. reliance on Middle Eastern oil. But he has not specifically repudiated the Carter Doctrine or its underlying premises. Rather, he has emphasized the need to preserve a robust U.S. military presence in the Persian Gulf area and to use force when necessary to protect vital American interests there — though exactly what these interests may be, he has yet to spell out in detail. Most of the commentary on Obama's Iraq policy has focused on his pledge to remove U.S. combat troops from the region. But in his first major speech as a candidate on national security affairs, at the Chicago Council on Global Affairs on April 23, 2007, he said that he was aware "that there are risks involved" in reducing American troop levels. "That is why," he continued, "my plan provides for an over-the-horizon force that could prevent chaos in the wider region" (emphasis added). Obama hasn't spelled out what he means by such a force, but presumably it would entail a larger air and naval presence in the greater Gulf region along with additional U.S. deployments in friendly countries like Kuwait, Oman, Qatar, and the United Arab Emirates. President Obama also warned of the threat posed by Iran's acquisition of nuclear weapons in much the same alarmist language George W. Bush used. Although he has emphasized reliance on diplomacy to achieve a peaceful outcome to this peril, Obama hasn't categorically ruled out the use of military force. Considering that the Iranians have repeatedly warned they'll respond to any American attack on their territory by blocking the flow of oil through the Strait of Hormuz, it's obvious the U.S. dispute with Iran over WMD — no less than that with Iraq — is closely tied to the geopolitical thrust of the Carter Doctrine. Thus, while any U.S. attack on Iran's nuclear facilities would be aimed in the first instance at neutralizing a potential nuclear danger, the ultimate objective would be to ensure the safety of Persian Gulf oil supplies. So long as the United States adheres to a policy that legitimates the use of military force to protect the flow of oil, we run the risk of involvement in one war after another in the ever-volatile Persian Gulf region. True, other issues and objectives have been associated with these wars, but the underlying strategic premise for every U.S. intervention in the Gulf since 1980 has been the core concept of the Carter Doctrine: to disallow a hostile power from gaining control of the region and blocking our access to its oil. This policy has done little to ensure us uninterrupted access to oil, and cost us great pain, misery, and expense. Despite the $600 billion or so we have already spent on the Iraq War (on the way to an estimated $2-$3 trillion, when all associated and follow-up costs are included), Iraq today is producing less oil today than it did when U.S. troops invaded the country six years ago. And despite the mammoth U.S. military presence in the Gulf area, Iran emerged as a major regional power amidst a rise in piracy and militant Islam. When all is said and done, conventional military force is an ineffective tool for protecting far-flung, highly vulnerable oil facilities and trade routes. There's only one way to reduce America's vulnerability to the disruption in overseas petroleum deliveries and that is to become less dependent on oil, period. We can't drill our way out of this predicament because the United States simply lacks enough domestic petroleum to satisfy our gargantuan requirements. We possess 2.5% of the world's proved oil reserves, yet consume 25% of its daily oil output. To achieve any sort of balance we have to cut our consumption substantially — and that means driving less, developing alternative fuels, converting to gas/electric hybrid and eventually all-electric cars, and otherwise transitioning away from reliance on oil. President Obama has promised to make a substantial investment in oil alternatives. Such efforts are expected to be a major component of his economic stimulus package and deserve strong public backing. But this is only half of the problem. To overcome what he calls the "tyranny of oil," he must also repudiate the Carter Doctrine and reject the use of military force to ensure access to Middle Eastern petroleum. Only in this way can we be certain that the Iraq War will be the last time U.S. soldiers shed their blood for oil.

Middle East conflict causes global nuclear war

Steinbach 2002 – Analyst, Center for Research on Globalisation , http://www.globalresearch.ca/articles/STE203A.html

Meanwhile, the existence of an arsenal of mass destruction in such an unstable region in turn has serious implications for future arms control and disarmament negotiations, and even the threat of nuclear war. Seymour Hersh warns, "Should war break out in the Middle East again,... or should any Arab nation fire missiles against Israel, as the Iraqis did, a nuclear escalation, once unthinkable except as a last resort, would now be a strong probability."(41) and Ezar Weissman, Israel's current President said "The nuclear issue is gaining momentum (and the) next war will not be conventional."(42) Russia and before it the Soviet Union has long been a major (if not the major) target of Israeli nukes. It is widely reported that the principal purpose of Jonathan Pollard's spying for Israel was to furnish satellite images of Soviet targets and other super sensitive data relating to U.S. nuclear targeting strategy. (43) (Since launching its own satellite in 1988, Israel no longer needs U.S. spy secrets.) Israeli nukes aimed at the Russian heartland seriously complicate disarmament and arms control negotiations and, at the very least, the unilateral possession of nuclear weapons by Israel is enormously destabilizing, and dramatically lowers the threshold for their actual use, if not for all out nuclear war. In the words of Mark Gaffney, "... if the familar pattern(Israel refining its weapons of mass destruction with U.S. complicity) is not reversed soon - for whatever reason - the deepening Middle East conflict could trigger a world conflagration."(44)

### SBSP can prevent Middle East dependence and conflict Morring 7 (Frank Jr., senior editor at Aviation Week, “NSSO Backs Space Solar Power”, 10-11-07, http://www.aviationweek.com/aw/generic/story\_channel.jsp?channel=space&id=news/solar101107. xml) OP

Collecting solar power in space and beaming it back to Earth is a relatively near-term possibility that could solve strategic and tactical security problems for the U.S. and its deployed forces, the Pentagon's National Security Space Office (NSSO) says in a report issued Oct. 10. As a clean source of energy that would be independent of foreign supplies in the strife-torn Middle East and elsewhere, space solar power (SSP) could ease America's longstanding strategic energy vulnerability, according to the "interim assessment" released at a press conference and on the Web site spacesolarpower.wordpress.com.

### Scenario Three is Resource Wars

### Now is key- resources will be depleted Alternative Heating 11 (“The Consequences of Oil Stocks Depletion”, 1-27-11, http://www.alternative-heating.com/oil-stocks.html) OP

Any way you look at it, the depletion of oil stocks has permanent negative effects on society as a whole worldwide. The United States is the number one consumer of oil in the world, with China following closely behind, and already we are starting to see the lasting effects of dependence upon oil production and oil stocks. Prices of oil products like heating oil are shooting through the roof, especially gas. However, the United States is not the only country at fault for the rising value and falling supply of oil. Global growth has led to a peak usage of oil throughout the world. Unless something is done soon to replace oil as a major source of energy, this resource will be depleted, and pocketbooks will begin to feel the pain as the situation worsens.

### Resource wars inevitable in the squo- oil production peak approaching

Heinberg ’05 (Richard Heinberg, American journalist and educator who has written extensively on ecological issues, including oil depletion. He is the author of at least ten books. “How to Avoid Oil Wars, Terrorism, and Economic Collapse”, August 2005, http://www.oildepletionprotocol.org/how\_to\_avoid\_oil\_wars\_terrorism\_and\_economic\_collapse) OP

By now most well-informed people are aware that global oil production may soon reach its all-time peak, and that the consequences will likely be severe. Already many important oil-producing nations (such as the United States, Indonesia, and Iran) and some whole regions (such as the North Sea) are past their production maximums. With nearly every passing year another country reaches a production plateau or begins its terminal decline. Meanwhile global rates of oil discovery have been falling since the early 1960s, as has been confirmed by ExxonMobil. All of the 100 or so supergiant fields that are collectively responsible for about half of current world production were discovered in the 1940s, '50s, '60s, and '70s. No fields of comparable size have been found since then; instead, exploration during recent years has turned up only much smaller fields that deplete relatively quickly. The result is that today only one new barrel of oil is being discovered for every four that are extracted and used. World leaders are hampered in their ability to assess the situation by a lack of consistent data. Proven petroleum reserve figures look reassuring: the world has roughly a trillion barrels yet to produce, perhaps more; indeed, official reserves figures have never been higher. However, circumstantial evidence suggests that some of the largest producing nations have inflated their reserves figures for political reasons. Meanwhile oil companies routinely (and legitimately) report reserve growth for fields discovered decades ago. In addition, reserves figures are often muddied by the inclusion of non-conventional petroleum resources, such oil sands - which do need to be taken into account, but in a separate category, as their rates of extraction are limited by factors different from those that constrain the production of conventional crude. As a consequence of all of these practices, oil reserves data tend to give an impression of expansion and plenty, while discovery and depletion data do the opposite. This apparent conflict in the data invites dispute among experts as to when the global oil peak is likely to occur. Some analysts say that the world is virtually at its peak of production now; others contend that the event can be delayed for two decades or more through enhanced investment in exploration, the adoption of new extraction technologies, and the substitution of non-conventional petroleum sources (oil sands, natural gas condensates, and heavy oil) for conventional crude. However, there is little or no disagreement that a series of production peaks is now within sight - first, for conventional non-OPEC oil; then for conventional oil globally; and finally for all global conventional and non-conventional petroleum sources combined. Moreover, even though there may be dispute as to the timing of these events, it is becoming widely acknowledged that the world peak in all combined petroleum sources will have significant global economic consequences. Mitigation efforts will require many years of work and trillions of dollars in investment. Even if optimistic forecasts of the timing of the global production peak turn out to be accurate, the world is facing an historic change that is unprecedented in scope and depth of impact. Due to systemic dependence on oil for transportation, agriculture, and the production of plastics and chemicals, every sector of every society will be affected. Efforts will be needed to create alternative sources of energy, to reduce demand for oil through heightened energy efficiency, and to redesign entire systems (including cities) to operate with less petroleum. These efforts will be challenging enough in the context of a stable economic environment. However, if prices for oil become extremely volatile, mitigation programs could be undermined. While high but stable prices would encourage conservation and investment in alternatives, prices that repeatedly skyrocket and then plummet could devastate entire economies and discourage long-term investment. Actual shortages of oil - of which price shocks would be only a symptom - would be even more devastating. The worst impacts would be suffered by those nations, and those aspects of national economies, that could not obtain oil at any price affordable to them. Supply interruptions would likely occur with greater frequency and for increasing lengths of time as global oil production gradually waned. Efforts to plan a long-term energy transition would be frustrated, in both importing and exporting countries. Meanwhile the perception among importers that exporting nations were profiteering would foment animosities and an escalating likelihood of international conflict. In short, the global peak in oil production is likely to lead to economic chaos and extreme geopolitical tensions, raising the spectres of war, revolution, terrorism, and even famine, unless nations adopt some method of cooperatively reducing their reliance on oil.

Resource wars cause extinction

Klare 6 (Michael T. Klare Ph.D, Professor of peace and world security studies at Hampshire University, “The Coming Resource Wars” http://www.alternet.org/story/33243/the\_coming\_resource\_wars, 3/10/2006)SV

It's official: the era of resource wars is upon us. In a major London address, British Defense Secretary John Reid warned that global climate change and dwindling natural resources are combining to increase the likelihood of violent conflict over land, water and energy. Climate change, he indicated, "will make scarce resources, clean water, viable agricultural land even scarcer" -- and this will "make the emergence of violent conflict more rather than less likely." Although not unprecedented, Reid's prediction of an upsurge in resource conflict is significant both because of his senior rank and the vehemence of his remarks. "The blunt truth is that the lack of water and agricultural land is a significant contributory factor to the tragic conflict we see unfolding in Darfur," he declared. "We should see this as a warning sign." Resource conflicts of this type are most likely to arise in the developing world, Reid indicated, but the more advanced and affluent countries are not likely to be spared the damaging and destabilizing effects of global climate change. With sea levels rising, water and energy becoming increasingly scarce and prime agricultural lands turning into deserts, internecine warfare over access to vital resources will become a global phenomenon. Reid's speech, delivered at the prestigious Chatham House in London (Britain's equivalent of the Council on Foreign Relations), is but the most recent expression of a growing trend in strategic circles to view environmental and resource effects -- rather than political orientation and ideology -- as the most potent source of armed conflict in the decades to come. With the world population rising, global consumption rates soaring, energy supplies rapidly disappearing and climate change eradicating valuable farmland, the stage is being set for persistent and worldwide struggles over vital resources. Religious and political strife will not disappear in this scenario, but rather will be channeled into contests over valuable sources of water, food and energy. Prior to Reid's address, the most significant expression of this outlook was a report prepared for the U.S. Department of Defense by a California-based consulting firm in October 2003. Entitled "An Abrupt Climate Change Scenario and Its Implications for United States National Security," the report warned that global climate change is more likely to result in sudden, cataclysmic environmental events than a gradual (and therefore manageable) rise in average temperatures. Such events could include a substantial increase in global sea levels, intense storms and hurricanes and continent-wide "dust bowl" effects. This would trigger pitched battles between the survivors of these effects for access to food, water, habitable land and energy supplies. "Violence and disruption stemming from the stresses created by abrupt changes in the climate pose a different type of threat to national security than we are accustomed to today," the 2003 report noted. "Military confrontation may be triggered by a desperate need for natural resources such as energy, food and water rather than by conflicts over ideology, religion or national honor." Until now, this mode of analysis has failed to command the attention of top American and British policymakers. For the most part, they insist that ideological and religious differences -- notably, the clash between values of tolerance and democracy on one hand and extremist forms of Islam on the other -- remain the main drivers of international conflict. But Reid's speech at Chatham House suggests that a major shift in strategic thinking may be under way. Environmental perils may soon dominate the world security agenda. This shift is due in part to the growing weight of evidence pointing to a significant human role in altering the planet's basic climate systems. Recent studies showing the rapid shrinkage of the polar ice caps, the accelerated melting of North American glaciers, the increased frequency of severe hurricanes and a number of other such effects all suggest that dramatic and potentially harmful changes to the global climate have begun to occur. More importantly, they conclude that human behavior -- most importantly, the burning of fossil fuels in factories, power plants, and motor vehicles -- is the most likely cause of these changes. This assessment may not have yet penetrated the White House and other bastions of head-in-the-sand thinking, but it is clearly gaining ground among scientists and thoughtful analysts around the world. For the most part, public discussion of global climate change has tended to describe its effects as an environmental problem -- as a threat to safe water, arable soil, temperate forests, certain species and so on. And, of course, climate change is a potent threat to the environment; in fact, the greatest threat imaginable. But viewing climate change as an environmental problem fails to do justice to the magnitude of the peril it poses. As Reid's speech and the 2003 Pentagon study make clear, the greatest danger posed by global climate change is not the degradation of ecosystems per se, but rather the disintegration of entire human societies, producing wholesale starvation, mass migrations and recurring conflict over resources. "As famine, disease, and weather-related disasters strike due to abrupt climate change," the Pentagon report notes, "many countries' needs will exceed their carrying capacity" -- that is, their ability to provide the minimum requirements for human survival. This "will create a sense of desperation, which is likely to lead to offensive aggression" against countries with a greater stock of vital resources. "Imagine eastern European countries, struggling to feed their populations with a falling supply of food, water, and energy, eyeing Russia, whose population is already in decline, for access to its grain, minerals, and energy supply." Similar scenarios will be replicated all across the planet, as those without the means to survival invade or migrate to those with greater abundance -- producing endless struggles between resource "haves" and "have-nots." It is this prospect, more than anything, that worries John Reid. In particular, he expressed concern over the inadequate capacity of poor and unstable countries to cope with the effects of climate change, and the resulting risk of state collapse, civil war and mass migration. "More than 300 million people in Africa currently lack access to safe water," he observed, and "climate change will worsen this dire situation" -- provoking more wars like Darfur. And even if these social disasters will occur primarily in the developing world, the wealthier countries will also be caught up in them, whether by participatin9g in peacekeeping and humanitarian aid operations, by fending off unwanted migrants or by fighting for access to overseas supplies of food, oil, and minerals. When reading of these nightmarish scenarios, it is easy to conjure up images of desperate, starving people killing one another with knives, staves and clubs -- as was certainly often the case in the past, and could easily prove to be so again. But these scenarios also envision the use of more deadly weapons. "In this world of warring states," the 2003 Pentagon report predicted, "nuclear arms proliferation is inevitable." As oil and natural gas disappears, more and more countries will rely on nuclear power to meet their energy needs -- and this "will accelerate nuclear proliferation as countries develop enrichment and reprocessing capabilities to ensure their national security." Although speculative, these reports make one thing clear: when thinking about the calamitous effects of global climate change, we must emphasize its social and political consequences as much as its purely environmental effects. Drought, flooding and storms can kill us, and surely will -- but so will wars among the survivors of these catastrophes over what remains of food, water and shelter. As Reid's comments indicate, no society, however affluent, will escape involvement in these forms of conflict.

## 1AC Warming Advantage

**Warming’s happening now – it’s real and anthropogenic**

**Rahmstorf, ‘8** (Stefan, Professor of Physics @ Potsdam University, Member of the German Advisory Council on Climate Change, Global Warming: Looking Beyond Kyoto, ed. Ernesto Zedillo, Prof. IR @ Yale, p. 42-49 accessed 6-27, Google Books, JG)

It is time to turn to statement B: human activities are altering the climate. This can be broken into two parts. The first is as follows: global climate is warming. This is by now a generally undisputed point (except by novelist Michael Crichton), so we deal with it only briefly. The two leading compilations of data measured with thermometers are shown in figure 3-3, that of the National Aeronautics and Space Administration (NASA) and that of the British Hadley Centre for Climate Change. Although they differ in the details, due to the inclusion of different data sets and use of different spatial averaging and quality control procedures, they both show a consistent picture, with a global mean warming of 0.8°C since the late nineteenth century. Temperatures over the past ten years clearly were the warmest since measured records have been available. The year 1998 sticks out well above the longterm trend due to the occurrence of a major El Nino event that year (the last El Nino so far and one of the strongest on record). These events are examples of the largest natural climate variations on multiyear time scales and, by releasing heat from the ocean, generally cause positive anomalies in global mean temperature. It is remarkable that the year 2005 rivaled the heat of 1998 even though no El Nino event occurred that year. (A bizarre curiosity, perhaps worth mentioning, is that several prominent "climate skeptics" recently used the extreme year 1998 to claim in the media that global warming had ended. In Lindzen's words, "Indeed, the absence of any record breakers during the past seven years is statistical evidence that temperatures are not increasing.")33 In addition to the surface measurements, the more recent portion of the global warming trend (since 1979) is also documented by satellite data. It is not straightforward to derive a reliable surface temperature trend from satellites, as they measure radiation coming from throughout the atmosphere (not just near the surface), including the stratosphere, which has strongly cooled, and the records are not homogeneous' due to the short life span of individual satellites, the problem of orbital decay, observations at different times of day, and drifts in instrument calibration.' Current analyses of these satellite data show trends that are fully consistent with surface measurements and model simulations." If no reliable temperature measurements existed, could we be sure that the climate is warming? The "canaries in the coal mine" of climate change (as glaciologist Lonnie Thompson puts it) ~are mountain glaciers. We know, both from old photographs and from the position of the terminal moraines heaped up by the flowing ice, that mountain glaciers have been in retreat all over the world during the past century. There are precious few exceptions, and they are associated with a strong increase in precipitation or local cooling.36 I have inspected examples of shrinking glaciers myself in field trips to Switzerland, Norway, and New Zealand. As glaciers respond sensitively to temperature changes, data on the extent of glaciers have been used to reconstruct a history of Northern Hemisphere temperature over the past four centuries (see figure 3-4). Cores drilled in tropical glaciers show signs of recent melting that is unprecedented at least throughout the Holocene-the past 10,000 years. Another powerful sign of warming, visible clearly from satellites, is the shrinking Arctic sea ice cover (figure 3-5), which has declined 20 percent since satellite observations began in 1979. While climate clearly became warmer in the twentieth century, much discussion particularly in the popular media has focused on the question of how "unusual" this warming is in a longer-term context. While this is an interesting question, it has often been mixed incorrectly with the question of causation. Scientifically, how unusual recent warming is-say, compared to the past millennium-in itself contains little information about its cause. Even a highly unusual warming could have a natural cause (for example, an exceptional increase in solar activity). And even a warming within the bounds of past natural variations could have a predominantly anthropogenic cause. I come to the question of causation shortly, after briefly visiting the evidence for past natural climate variations. Records from the time before systematic temperature measurements were collected are based on "proxy data," coming from tree rings, ice cores, corals, and other sources. These proxy data are generally linked to local temperatures in some way, but they may be influenced by other parameters as well (for example, precipitation), they may have a seasonal bias (for example, the growth season for tree rings), and high-quality long records are difficult to obtain and therefore few in number and geographic coverage. Therefore, there is still substantial uncertainty in the evolution of past global or hemispheric temperatures. (Comparing only local or regional temperature; as in Europe, is of limited value for our purposes,' as regional variations can be much larger than global ones and can have many regional causes, unrelated to global-scale forcing and climate change.) The first quantitative reconstruction for the Northern Hemisphere temperature of the past millennium, including an error estimation, was presented by Mann, Bradley, and Hughes and rightly highlighted in the 2001 IPCC report as one of the major new findings since its 1995 report; it is shown in figure 3\_6.39 The analysis suggests that, despite the large error bars, twentieth-century warming is indeed highly unusual and probably was unprecedented during the past millennium. This result, presumably because of its symbolic power, has attracted much criticism, to some extent in scientific journals, but even more so in the popular media. The hockey stick-shaped curve became a symbol for the IPCC, .and criticizing this particular data analysis became an avenue for some to question the credibility of the IPCC. Three important things have been overlooked in much of the media coverage. First, even if the scientific critics had been right, this would not have called into question the very cautious conclusion drawn by the IPCC from the reconstruction by Mann, Bradley, and Hughes: "New analyses of proxy data for the Northern Hemisphere indicate that the increase in temperature in the twentieth century is likely to have been the largest of any century during the past 1,000 years." This conclusion has since been supported further by every single one of close to a dozen new reconstructions (two of which are shown in figure 3-6). Second, by far the most serious scientific criticism raised against Mann, Hughes, and Bradley was simply based on a mistake. 40 The prominent paper of von Storch and others, which claimed (based on a model test) that the method of Mann, Bradley, and Hughes systematically underestimated variability, "was [itself] based on incorrect implementation of the reconstruction procedure."41 With correct implementation, climate field reconstruction procedures such as the one used by Mann, Bradley, and Hughes have been shown to perform well in similar model tests. Third, whether their reconstruction is accurate or not has no bearing on policy. If their analysis underestimated past natural climate variability, this would certainly not argue for a smaller climate sensitivity and thus a lesser concern about the consequences of our emissions. Some have argued that, in contrast, it would point to a larger climate sensitivity. While this is a valid point in principle, it does not apply in practice to the climate sensitivity estimates discussed herein or to the range given by IPCC, since these did not use the reconstruction of Mann, Hughes, and Bradley or any other proxy records of the past millennium. Media claims that "a pillar of the Kyoto Protocol" had been called into question were therefore misinformed. As an aside,the protocol was agreed in 1997, before the reconstruction in question even existed. The overheated public debate on this topic has, at least, helped to attract more researchers and funding to this area of paleoclimatology; its methodology has advanced significantly, and a number of new reconstructions have been presented in recent years. While the science has moved forward, the first seminal reconstruction by Mann, Hughes, and Bradley has held up remarkably well, with its main features reproduced by more recent work. Further progress probably will require substantial amounts of new proxy data, rather than further refinement of the statistical techniques pioneered by Mann, Hughes, and Bradley. Developing these data sets will require time and substantial effort. It is time to address the final statement: most of the observed warming over the past fifty years is anthropogenic. A large number of studies exist that have taken different approaches to analyze this issue, which is generally called the "attribution problem." I do not discuss the exact share of the anthropogenic contribution (although this is an interesting question). By "most" I imply mean "more than 50 percent.” The first and crucial piece of evidence is, of course, that the magnitude of the warming is what is expected from the anthropogenic perturbation of the radiation balance, so anthropogenic forcing is able to explain all of the temperature rise. As discussed here, the rise in greenhouse gases alone corresponds to 2.6 W/tn2 of forcing. This by itself, after subtraction of the observed 0'.6 W/m2 of ocean heat uptake, would Cause 1.6°C of warming since preindustrial times for medium climate sensitivity (3"C). With a current "best guess'; aerosol forcing of 1 W/m2, the expected warming is O.8°c. The point here is not that it is possible to obtain the 'exact observed number-this is fortuitous because the amount of aerosol' forcing is still very' uncertain-but that the expected magnitude is roughly right. There can be little doubt that the anthropogenic forcing is large enough to explain most of the warming. Depending on aerosol forcing and climate sensitivity, it could explain a large fraction of the warming, or all of it, or even more warming than has been observed (leaving room for natural processes to counteract some of the warming). The second important piece of evidence is clear: there is no viable alternative explanation. In the scientific literature, no serious alternative hypothesis has been proposed to explain the observed global warming. Other possible causes, such as solar activity, volcanic activity, cosmic rays, or orbital cycles, are well observed, but they do not show trends capable of explaining the observed warming. Since 1978, solar irradiance has been measured directly from satellites and shows the well-known eleven-year solar cycle, but no trend. There are various estimates of solar variability before this time, based on sunspot numbers, solar cycle length, the geomagnetic AA index, neutron monitor data, and, carbon-14 data. These indicate that solar activity probably increased somewhat up to 1940. While there is disagreement about the variation in previous centuries, different authors agree that solar activity did not significantly increase during the last sixty-five years. Therefore, this cannot explain the warming, and neither can any of the other factors mentioned. Models driven by natural factors only, leaving the anthropogenic forcing aside, show a cooling in the second half of the twentieth century (for an example, See figure 2-2, panel a, in chapter 2 of this volume). The trend in the sum of natural forcings is downward. The only way out would be either some as yet undiscovered unknown forcing or a warming trend that arises by chance from an unforced internal variability in the climate system. The latter cannot be completely ruled out, but has to be considered highly unlikely. No evidence in the observed record, proxy data, or current models suggest that such internal variability could cause a sustained trend of global warming of the observed magnitude. As discussed twentieth century warming is unprecedented over the past 1,000 years, (or even 2,000 years, as the few longer reconstructions available now suggest), which does not 'support the idea of large internal fluctuations. Also, those past variations correlate well with past forcing (solar variability, volcanic activity) and thus appear to be largely forced rather than due to unforced internal variability." And indeed, it would be difficult for a large and sustained unforced variability to satisfy the fundamental physical law of energy conservation. Natural internal variability generally shifts heat around different parts of the climate system-for example, the large El Nino event of 1998, which warmed, the atmosphere by releasing heat stored in the ocean. This mechanism implies that the ocean heat content drops as the atmosphere warms. For past decades, as discussed, we observed the atmosphere warming and the ocean heat content increasing, which rules out heat release from the ocean as a cause of surface warming. The heat content of the whole climate system is increasing, and there is no plausible source of this heat other than the heat trapped by greenhouse gases. ' A completely different approach to attribution is to analyze the spatial patterns of climate change. This is done in so-called fingerprint studies, which associate particular patterns or "fingerprints" with different forcings. It is plausible that the pattern of a solar-forced climate change differs from the pattern of a change caused by greenhouse gases. For example, a characteristic of greenhouse gases is that heat is trapped closer to the Earth's surface and that, unlike solar variability, greenhouse gases tend to warm more in winter, and at night. Such studies have used different data sets and have been performed by different groups of researchers with different statistical methods. They consistently conclude that the observed spatial pattern of warming can only be explained by greenhouse gases.49 Overall, it has to be considered, highly likely' that the observed warming is indeed predominantly due to the human-caused increase in greenhouse gases. ' This paper discussed the evidence for the anthropogenic increase in atmospheric CO2 concentration and the effect of CO2 on climate, finding that this anthropogenic increase is proven beyond reasonable doubt and that a mass of evidence points to a CO2 effect on climate of 3C ± 1.59C global-warming for a doubling of concentration. (This is, the classic IPCC range; my personal assessment is that, in-the light of new studies since the IPCC Third Assessment Report, the uncertainty range can now be narrowed somewhat to 3°C ± 1.0C) This is based on consistent results from theory, models, and data analysis, and, even in the absence-of any computer models, the same result would still hold based on physics and on data from climate history alone. Considering the plethora of consistent evidence, the chance that these conclusions are wrong has to be considered minute. If the preceding is accepted, then it follows logically and incontrovertibly that a further increase in CO2 concentration will lead to further warming. The magnitude of our emissions depends on human behavior, but the climatic response to various emissions scenarios can be computed from the information presented here. The result is the famous range of future global temperature scenarios shown in figure 3\_6.50 Two additional steps are involved in these computations: the consideration of anthropogenic forcings other than CO2 (for example, other greenhouse gases and aerosols) and the computation of concentrations from the emissions. Other gases are not discussed here, although they are important to get quantitatively accurate results. CO2 is the largest and most important forcing. Concerning concentrations, the scenarios shown basically assume that ocean and biosphere take up a similar share of our emitted CO2 as in the past. This could turn out to be an optimistic assumption; some models indicate the possibility of a positive feedback, with the biosphere turning into a carbon source rather than a sink under growing climatic stress. It is clear that even in the more optimistic of the shown (non-mitigation) scenarios, global temperature would rise by 2-3°C above its preindustrial level by the end of this century. Even for a paleoclimatologist like myself, this is an extraordinarily high temperature, which is very likely unprecedented in at least the past 100,000 years. As far as the data show, we would have to go back about 3 million years, to the Pliocene, for comparable temperatures. The rate of this warming (which is important for the ability of ecosystems to cope) is also highly unusual and unprecedented probably for an even longer time. The last major global warming trend occurred when the last great Ice Age ended between 15,000 and 10,000 years ago: this was a warming of about 5°C over 5,000 years, that is, a rate of only 0.1 °C per century. 52 The expected magnitude and rate of planetary warming is highly likely to come with major risk and impacts in terms of sea level rise (Pliocene sea level was 25-35 meters higher than now due to smaller Greenland and Antarctic ice sheets), extreme events (for example, hurricane activity is expected to increase in a warmer climate), and ecosystem loss. The second part of this paper examined the evidence for the current warming of the planet and discussed what is known about its causes. This part showed that global warming is already a measured and well-established fact, not a theory. Many different lines of evidence consistently show that most of the observed warming of the past fifty years was caused by human activity. Above all, this warming is exactly what would be expected given the anthropogenic rise in greenhouse gases, and no viable alternative explanation for this warming has been proposed in the scientific literature. Taken together., the very strong evidence accumulated from thousands of independent studies, has over the past decades convinced virtually every climatologist around the world (many of whom were initially quite skeptical, including myself) that anthropogenic global warming is a reality with which we need to deal.

### Warming is rapid- fossil fuel emissions risks release of stored carbon, which causes runaway warming- the next 30 years are key.

Stein 11 (David, SCIENCE EDITOR for The Canadian (newspaper), Antartic melting becomes Global time bomb, July 17, http://www.agoracosmopolitan.com/news/nature/2011/07/17/172.html)

The immediate threat of runaway global warming and climate change melt-down There are 'carbon bombs': carbon in soils, carbon in warming temperate and boreal forests and in a drought struck Amazon, methane in Arctic peat bogs and in methane hydrates melting in warming ocean waters. "For several decades it has been hypothesized that rising temperatures from increased greenhouse gases in the atmosphere due to burning fossil fuels could be releasing some of and eventually all of these stored carbon stocks to add substantially more potent greenhouse gases to the atmosphere," Bill Henderson further elaborates. Given time lags of 30-50 years, we might have already put enough extra greenhouse gases into the atmosphere to have crossed a threshold to these bombs exploding, their released greenhouse gases leading to ever accelerating global warming with future global temperatures maybe tens of degrees higher than our norms of human habitation and therefore extinction or very near extinction of humanity. "(T)he science is clear. We need not a 20% cut by 2020; not a 60% cut by 2050, but a 90% cut by 2030 (1). Only then do we stand a good chance of keeping carbon concentrations in the atmosphere below 430 parts per million, which means that only then do we stand a good chance of preventing some of the threatened positive feedbacks. If we let it get beyond that point there is nothing we can do. The biosphere takes over as the primary source of carbon. It is out of our hands," George Monbiot says. Ticking Time Bomb by John Atcheson , a geologist writing in the Baltimore Sun, is the best and almost only mainstream media explanation of runaway global warming and how close we are to extinction. "There are enormous quantities of naturally occurring greenhouse gasses trapped in ice-like structures in the cold northern muds and at the bottom of the seas. These ices, called clathrates, contain 3,000 times as much methane as is in the atmosphere. Methane is more than 20 times as strong a greenhouse gas as carbon dioxide."

### Warming leads to extinction – try or die

Romm 10 (Jon, Editor of Climate Progress, “Disputing the “consensus” on global warming,” http://climateprogress.org/2010/06/16/scientific-consensus-on-global-warming-climate-science/, JG)

A good example of how scientific evidence drives our understanding concerns how we know that humans are the dominant cause of global warming. This is, of course, the deniers’ favorite topic. Since it is increasingly obvious that the climate is changing and the planet is warming, the remaining deniers have coalesced to defend their Alamo — that human emissions aren’t the cause of recent climate change and therefore that reducing those emissions is pointless. Last year, longtime Nation columnist Alexander Cockburn wrote, “There is still zero empirical evidence that anthropogenic production of CO2 is making any measurable contribution to the world’s present warming trend. The greenhouse fearmongers rely entirely on unverified, crudely oversimplified computer models to finger mankind’s sinful contribution.” In fact, the evidence is amazingly strong. Moreover, if the relatively complex climate models are oversimplified in any respect, it is by omitting amplifying feedbacks and other factors that suggest human-caused climate change will be worse than is widely realized. The IPCC concluded last year: “Greenhouse gas forcing has very likely (>90 percent) caused most of the observed global warming over the last 50 years. This conclusion takes into account … the possibility that the response to solar forcing could be underestimated by climate models.” Scientists have come to understand that “forcings” (natural and human-made) explain most of the changes in our climate and temperature both in recent decades and over the past millions of years. The primary human-made forcings are the heat-trapping greenhouse gases we generate, particularly carbon dioxide from burning coal, oil and natural gas. The natural forcings include fluctuations in the intensity of sunlight (which can increase or decrease warming), and major volcanoes that inject huge volumes of gases and aerosol particles into the stratosphere (which tend to block sunlight and cause cooling)…. Over and over again, scientists have demonstrated that observed changes in the climate in recent decades can only be explained by taking into account the observed combination of human and natural forcings. Natural forcings alone just don’t explain what is happening to this planet. For instance, in April 2005, one of the nation’s top climate scientists, NASA’s James Hansen, led a team of scientists that made “precise measurements of increasing ocean heat content over the past 10 years,” which revealed that the Earth is absorbing far more heat than it is emitting to space, confirming what earlier computer models had shown about warming. Hansen called this energy imbalance the “smoking gun” of climate change, and said, “There can no longer be genuine doubt that human-made gases are the dominant cause of observed warming.” Another 2005 study, led by the Scripps Institution of Oceanography, compared actual ocean temperature data from the surface down to hundreds of meters (in the Atlantic, Pacific and Indian oceans) with climate models and concluded: A warming signal has penetrated into the world’s oceans over the past 40 years. The signal is complex, with a vertical structure that varies widely by ocean; it cannot be explained by natural internal climate variability or solar and volcanic forcing, but is well simulated by two anthropogenically [human-caused] forced climate models. We conclude that it is of human origin, a conclusion robust to observational sampling and model differences. Such studies are also done for many other observations: land-based temperature rise, atmospheric temperature rise, sea level rise, arctic ice melt, inland glacier melt, Greeland and Antarctic ice sheet melt, expansion of the tropics (desertification) and changes in precipitation. Studies compare every testable prediction from climate change theory and models (and suggested by paleoclimate research) to actual observations. How many studies? Well, the IPCC’s definitive treatment of the subject, “Understanding and Attributing Climate Change,” has 11 full pages of references, some 500 peer-reviewed studies. This is not a consensus of opinion. It is what scientific research and actual observations reveal. And the science behind human attribution has gotten much stronger in the past 2 years (see a recent literature review by the Met Office here). That brings us to another problem with the word “consensus.” It can mean “unanimity” or “the judgment arrived at by most of those concerned.” Many, if not most, people hear the second meaning: “consensus” as majority opinion. The scientific consensus most people are familiar with is the IPCC’s “Summary for Policymakers” reports. But those aren’t a majority opinion. Government representatives participate in a line-by-line review and revision of these summaries. So China, Saudi Arabia and that hotbed of denialism — the Bush administration — get to veto anything they don’t like. The deniers call this “politicized science,” suggesting the process turns the IPCC summaries into some sort of unscientific exaggeration. In fact, the reverse is true. The net result is unanimous agreement on a conservative or watered-down document. You could argue that rather than majority rules, this is “minority rules.” Last April, in an article titled “Conservative Climate,” Scientific American noted that objections by Saudi Arabia and China led the IPCC to remove a sentence stating that the impact of human greenhouse gas emissions on the Earth’s recent warming is five times greater than that of the sun. In fact, lead author Piers Forster of the University of Leeds in England said, “The difference is really a factor of 10.” Then I discuss the evidence we had even back in 2008 that the IPCC was underestimating key climate impacts, a point I update here. The bottom line is that recent observations and research make clear the planet almost certainly faces a greater and more imminent threat than is laid out in the IPCC reports. That’s why climate scientists are so desperate. That’s why they keep begging for immediate action. And that’s why the “consensus on global warming” is a phrase that should be forever retired from the climate debate. The leading scientific organizations in this country and around the world, including all the major national academies of science, aren’t buying into some sort of consensus of opinion. They have analyzed the science and observations and expressed their understanding of climate science and the likely impacts we face on our current emissions path — an understanding that has grown increasingly dire in recent years (see “An illustrated guide to the latest climate science” and “An introduction to global warming impacts: Hell and High Water“).

### Independently it displaces billions – causes civil wars, terrorism, and genocide in the short term

CSM, ‘7 – Christian Science Monitor [4/19/2007, Christian Science Monitor, “Could global warming cause war?,” http://www.csmonitor.com/2007/0419/p02s01-usgn.html, DS]

For years, the debate over global warming has focused on the three big "E's": environment, energy, and economic impact. This week it officially entered the realm of national security threats and avoiding wars as well. A platoon of retired US generals and admirals warned that global warming "presents significant national security challenges to the United States." The United Nations Security Council held its first ever debate on the impact of climate change on conflicts. And in Congress, a bipartisan bill would require a National Intelligence Estimate by all federal intelligence agencies to assess the security threats posed by global climate change. Many experts view climate change as a "threat multiplier" that intensifies instability around the world by worsening water shortages, food insecurity, disease, and flooding that lead to forced migration. That's the thrust of a 35-page report (PDF) by 11 admirals and generals this week issued by the Alexandria, Va.-based national security think tank The CNA Corporation. The study, titled National Security and the Threat of Climate Change, predicts: "Projected climate change will seriously exacerbate already marginal living standards in many Asian, African, and Middle Eastern nations, causing widespread political instability and the likelihood of failed states.... The chaos that results can be an incubator of civil strife, genocide, and the growth of terrorism. "The U.S. may be drawn more frequently into these situations, either alone or with allies, to help provide stability before conditions worsen and are exploited by extremists. The U.S. may also be called upon to undertake stability and reconstruction efforts once a conflict has begun, to avert further disaster and reconstitute a stable environment." "We will pay for this one way or another," retired Marine Gen. Anthony Zinni, former commander of American forces in the Middle East and one of the report's authors, told the Los Angeles Times. "We will pay to reduce greenhouse gas emissions today … or we'll pay the price later in military terms. And that will involve human lives." As quoted in the Associated Press, British Foreign Secretary Margaret Beckett, who presided over the UN meeting in New York April 17, posed the question "What makes wars start?" The answer: "Fights over water. Changing patterns of rainfall. Fights over food production, land use. There are few greater potential threats to our economies ... but also to peace and security itself." This is the concern behind a recently introduced bipartisan bill by Sens. Richard Durbin (D) of Illinois and Chuck Hagel (R) of Nebraska. It would require all US intelligence agencies – the CIA, the NSA, the Pentagon, and the FBI – to conduct a comprehensive review of potential security threats related to climate change around the world. "Many of the most severe effects of global warming are expected in regions where fragile governments are least capable of responding to them," Senator Durbin said in a story from the Inter Press Service news agency in Rome. "Failing to recognize and plan for the geopolitical consequences of global warming would be a serious mistake." Rep. Edward J. Markey (D) of Massachusetts, chairman of the newly formed House Select Committee on Energy Independence and Global Warming, is proposing companion legislation that would fund climate change plans by the Department of Defense. On his website, Mr. Markey called for action based on the retired senior officers' report, saying: "Global warming's impacts on natural resources and climate systems may create the fiercest battle our world has ever seen. If we don't cut pollution and head off severe global warming at the pass, we could see extreme geopolitical strain over decreased clean water, environmental refugees, and other impacts." In a speech April 16 to BritishAmerican Business Inc., a trans-Atlantic business organization, British Foreign Secretary Beckett "praised the growing actions of US business executives and state politicians in addressing climate change, including California Governor Arnold Schwarzenegger, who along with British Prime Minister Tony Blair announced plans last year to work toward a possible joint emissions-trading market," reported the Associated Press. Ms. Beckett also told the business executives that clean technology is going to create a "massive" market opportunities: "Those who move into that market first – first to design, first to patent, first to sell, first to invest, first to build a brand – have an unparalleled chance to make money." The Bush administration has taken a less stark view of the security implications of greenhouse-gas emissions than many scientists and military officers. But in a broader context, the administration has agreed that environmental issues could present national and international security challenges. In its 2006 National Security Strategy (PDF), the administration acknowledged that environmental destruction, including that caused by human activity, "may overwhelm the capacity of local authorities to respond, and may even overtax national militaries, requiring a larger international response." "These challenges are not traditional national security concerns, such as the conflict of arms or ideologies. But if left unaddressed they can threaten national security." These concerns are likely to keep growing and continue to be on the agendas at international meetings. A strongly worded draft communiqué for June's G8 summit in Heiligendamm, Germany, warns that "tackling climate change is an imperative, not a choice," reported the British newspaper The Independent on Sunday. The draft says: "Global warming caused largely by human activities is accelerating [and it] will seriously damage our common natural environment and severely weaken [the] global economy, with implications for international security."

### Warming’s net negative now – insects, diseases, invasive diseases, and droughts all outweigh fertilization

Garber, ‘8 – reporter for US News and World Report [Kent, 5/28/2008, US News and World Report, “How Global Warming Will Hurt Crops,” http://www.usnews.com/articles/news/2008/05/28/how-global-warming-will-hurt-crops.html, DS]

The global food supply, as recent events have shown all too clearly, is threatened by many problems. Some of them are man-made; some are natural. The natural ones tend to be obvious—droughts, floods, hurricanes, earthquakes—and, in the past year alone, they have been notably devastating. Searing droughts in Australia and central Europe have squandered wheat supplies; more recently, Cyclone Nargis destroyed rice stocks for millions of people in Myanmar. Historically, the damage to food supplies by bad weather has been regarded as fleeting: catastrophic in the short term but ultimately remitting. Droughts ease, floodwaters recede, and farmers replant their crops. But as a new government report indicates, such views are increasingly narrow and outdated, in that they fail to acknowledge the creeping reach of global climate change. The report, released Tuesday, offers one of the most comprehensive looks yet at the impact that climate change is expected to have on U.S. agriculture over the next several decades. Not surprisingly, the prognosis is grim. Temperatures in the United States, scientists say, will rise on average by about 1.2 degrees Celsius by 2040, with carbon dioxide levels up more than 15 percent. The consequences for American-grown food, the report finds, will most likely be far-reaching: Some crop yields are predicted to drop; growing seasons will get longer and use more water; weeds and shrubs will grow faster and spread into new territory, some of it arable farmland; and insect and crop disease outbreaks will become more frequent. The new report, which was produced by more than a dozen agencies over multiple years and reflects the findings of more than 1,000 scientific studies, offers only predictions, but the predictions reflect a high degree of confidence. In a sense, there is a vein of fatalism among most scientists about what will happen in the next few decades. Government actions, they say, may alter the trajectory of climate change 50 to 100 years from now, but the fate of climate change in the short term has been largely shaped by past behavior, by carbon already released into the atmosphere. The question now is the extent of its impact. Some agricultural changes are already observable. In the central Great Plains, in states known for their grassy prairies and sprawling row crops, there are new neighbors: trees and large shrubs, often clustering in islands in the middle of fields. In the Southwest, perennial grasses have been largely pushed out by mesquite bushes, those long-rooted staples of the desert. And the invasive kudzu vine, formerly a nuisance only to the South, has advanced steadily northward, forming a staggered line stretching from Connecticut to Illinois. Human practices in all three cases have abetted the turnover, but climate change, scientists say, has been a primary driver, as invasive species reproduce more quickly and expand into areas once deemed too cold for their survival. In turn, high-quality pastureland, once ideal for livestock grazing, has become poor-quality brush, and farmland faces competitors for space. In the next 30 years these problems will very likely expand and multiply, as an already taxed food system faces threats on multiple fronts. A rise in temperature—even as little as 1 degree Celsius—could cause many plantings to fail, the report indicates, since pollen and seeds are sensitive to slight temperature changes. Yields of corn and rice are expected to decline slightly. Heat-sensitive fruits and vegetables, such as tomatoes, will most likely suffer. Some of the potential damage will be blunted by higher carbon dioxide levels; soybean yields, for instance, will probably improve, because soybeans (and several other crops) thrive from higher carbon inputs. But if temperatures keep rising, the balance will ultimately tip: At some extreme temperature, cells stop dividing, and pollen dies. High ozone levels, which have risen sixfold in the United States in the past century and are expected to rise further, will suppress yields as well. In fact, ozone levels are already extremely high in the eastern and midwestern regions of the country, rivaled globally only by eastern China (no model of air quality, to be sure) and parts of western Europe. One recent study, for instance, found that high ozone levels significantly suppress yields of soybean, wheat, and peanuts in the Midwest. Eventually, the effects of climate change, far from being limited to individual plants, could percolate throughout entire ecosystems. If springs become warmer, as predicted, the crop-growing season will expand. Insects and pests, thriving in warmer winters, will reproduce more frequently and spread more rapidly. Many, in fact, are proliferating already, as reflected in reports of abnormally high rates of disease outbreaks in the western half of the United States. Higher temperatures also are usually accompanied by declining rainfall, threatening to slowly transform once lush areas into arid expanses. At the same time, droughts and heavy isolated rainfalls could become more numerous. For all the criticism that has been piled upon the $300 billion farm bill that Congress recently passed over President Bush's veto, the bill does include many provisions that pertain directly to concerns cited in the new report. Fruit and vegetable growers, for instance, will receive millions of dollars of new funding for research on pest and disease resistance.

**SPS is the only solution to warming**

**Hsu 10** (Feng, PhD in Engineering, 12-2010, “Harnessing the Sun: Embarking on Humanity's Next Giant Leap,” Online Journal of Space Communication, http://spacejournal.ohio.edu/issue16/hsu.html, JG)

It has become increasingly evident that facing and solving the multiple issues concerning energy is the single most pressing problem that we face as a species. In recent years, there has been extensive debate and media coverage about alternative energy, sustainable development and global climate change, but what has been missing (at least in the mainstream media) is the knowledge and point of view of scientists and engineers. From the scientists or engineers perspective, this paper discusses the prospects for mankind's technological capability and societal will in harnessing solar energy, and focuses on the issues of: 1) space based solar power (SBSP) development, and, 2) why it is imperative that we must harness the unparalleled power of the sun in a massive and unprecedented scale, which I believe will be humanity's next giant leap forward. Solar Power from a Historic Perspective Whether terrestrially based or space based, solar energy has not yet emerged as a significant solution in public discussions of global warming. Yet, among scientists and engineers and other visionaries, it is starting to be viewed as one of the most promising and viable ways to eventually remove human dependence on fossil fuels. Nearly three years ago at the Foundation For the Future (FFF) International Energy Conference, my presentation was one of the few that took a look back at energy use in human history[1]. In this paper, I would like to offer a brief summary of the various stages mankind has passed through in our quest for energy, and how long they lasted. To understand and fully appreciate the profound idea that humankind has and can continue to harness sun's energy, it is imperative for us to learn from the history of our civilization and from the perspective of human evolution, especially from those societies in crisis over energy. Previewing the history of human energy consumption and energy technologies, we can see that there were three such eras. In the early years of human presence on this planet, we relied on wood-generated energy, based on the burning of firewood, tree branches and the remains of agricultural harvests. Starting in the 1600s, our forefathers discovered the energy properties of coal, which taught us how to tap stored supplies of fossil fuels. Less than two hundred years later, about the middle of the 1800s, we found petroleum and learned to commercialize the use of oil and gas, which brought about our current industrial civilization. In the 20th century, society witnessed the dawn of electricity generation via hydro-power and atomic energy. Today, demand for energy continues to soar, but we're rapidly using up our supplies of easily accessible fossil fuels. What is more, a profound environmental crisis has emerged as the result of our total reliance on energy sources based on those fuels. In the 21st century, there is great uncertainty about world energy supplies. If you plot energy demand by year of human civilization on a terawatt scale, you will see the huge bump that occurred barely a hundred years ago (Figure 1). Before that, in the Stone Age, basically the cultivation of fire led to the emergence of agriculture, cooking, tool making, and all the early stages of human civilization. Now, after about 150 years of burning fossil fuels, the earth's 3 billion years' store of solar energy has been plundered. In my view, mankind must now embark on the next era of sustainable energy consumption and re-supply. The most obvious source of which is the mighty energy resource of our sun. Adequately guide and using human creativity and innovation; the 21st century will become the next great leap forward in human civilization by taming solar energy, transforming our combustion world economy into a lasting solar-electric world economy. issue pic Figure 1. An approximation of fossil fuel age on the scale of human history. (click image for larger view) In solving humanity's energy problems we must learn from our ancestors. Taming the natural forces of the sun will be much like our ancestors' early efforts to harness the power of wild fire. We must use common sense, as they did, developing the tools and technologies that address the needs of our time. The Romans used flaming oil containers to destroy the Saracen fleet in 670. In the same century, the Japanese were digging wells to a depth approaching 900 feet with picks and shovels in search of oil. By 1100, the Chinese had reached depths of more than 3,000 feet in search of energy. This happened centuries before the West had sunk its first commercial well in 1859 in Titusville, Pennsylvania. With all such human creativities in the past, the searching for energy has been driven by our combustion world economy, which focused primarily on what's beneath the surface of our planet - the secondary energy resources which originated from the power of our sun. Now it's time for mankind to lift their heads and start focusing our profound creativity in harnessing the sun and making our way into the energy technology frontiers in the sky. Solar Energy - The Ultimate Answer to Anthropogenic Climate Change The evidence of global warming is alarming. The potential for a catastrophic climate change scenario is dire. Until recently, I worked at Goddard Space Flight Center, a NASA research center in the forefront of space and earth science research. This Center is engaged in monitoring and analyzing climate changes on a global scale. I received first hand scientific information and data relating to global warming issues, including the latest dynamics of ice cap melting and changes that occurred on either pole of our planet. I had the chance to discuss this research with my Goddard colleagues, who are world leading experts on the subject. I now have no doubt global temperatures are rising, and that global warming is a serious problem confronting all of humanity. No matter whether these trends are due to human interference or to the cosmic cycling of our solar system, there are two basic facts that are crystal clear: a) there is overwhelming scientific evidence showing positive correlations between the level of CO2 concentrations in the earth's atmosphere with respect to the historical fluctuations of global temperature changes; and b) the overwhelming majority of the world's scientific community is in agreement about the risks of a potential catastrophic global climate change. That is, if we humans continue to ignore this problem and do nothing, if we continue dumping huge quantities of greenhouse gases into earth's biosphere, humanity will be at dire risk. As a technical and technology risk assessment expert, I could show with confidence that we face orders of magnitude more risk doing nothing to curb our fossil-based energy addictions than we will in making a fundamental shift in our energy supply. This is because the risks of a catastrophic anthropogenic climate change can be potentially the extinction of human species, a risk that is simply too high for us to take any chances. Of course, there will be economic consequences to all societies when we restrict the burning of fossil fuels in an effort to abate "global warming." What we are talking about are options and choices between risks. All human activities involve risk taking; we cannot avoid risks but only make trade-offs, hopefully choosing wisely. In this case, there has to be a risk-based probabilistic thought process when it comes to adopting national or international policies in dealing with global warming and energy issues. As the measure of risk is a product of "likelihood" and "consequence," when consequence or risk of a potential human extinction (due to catastrophic climate change) is to be compared with the potential consequence or risk of loss of jobs or slowing the growth of economy (due to restriction of fossil-based energy consumption), I believe the choice is clear. My view is that by making a paradigm shift in the world's energy supply over time through extensive R&D, technology innovations and increased production of renewable energy, we will create countless new careers and jobs and end up triggering the next level of economic development, the kind of pollution free industrial revolution mankind has never before seen. The aggravation and acceleration of a potential anthropogenic catastrophic global climate change, in my opinion, is the number one risk incurred from our combustion-based world economy. At the International Energy Conference in Seattle, I showed three pairs of satellite images as evidence that the earth glaciers are disappearing at an alarming rate.[2] Whether this warming trend can be reversed by human intervention is not clear, but this uncertainty in risk reduction doesn't justify the human inactions in adapting policies and countermeasures on renewable energy development for a sustainable world economy, and for curbing the likelihood of any risk event of anthropogenic catastrophic climate changes. What is imperative is that we start to do something in a significant way that has a chance to make a difference.

**It’s not too late – best simulations prove that massive cuts can check back**

**NERSC, 9** (National Energy Research Scientific Computing Center, NERSC.gov, It’s not too late to change Global Warmings Course, Simulations show that cuts in greenhouse gas emissions would save arctic ice, reduce sea level rise, http://www.nersc.gov/news-publications/science-news/2009/it-s-not-too-late/, JG)

The threat of global warming can still be greatly diminished if nations cut emissions of heat-trapping greenhouse gases by 70 percent this century, according to a study led by scientists at the National Center for Atmospheric Research (NCAR). While global temperatures would rise, the most dangerous potential aspects of climate change, including massive losses of Arctic sea ice and permafrost and significant sea level rise, could be partially avoided. "This research indicates that we can no longer avoid significant warming during this century," says NCAR scientist Warren Washington, the lead author. "But if the world were to implement this level of emission cuts, we could stabilize the threat of climate change and avoid an even greater catastrophe." To simulate a century of climate conditions, the researchers used more than 2000 processors of Franklin, the National Energy Research Scientific Computing Center's (NERSC) Cray XT4 system, as well as computers at the Oak Ridge and Argonne Leadership Computing Facilities and at NCAR. Over the past two years, the NCAR team received a total allocation of 50 million processor hours on NERSC computers for a variety of climate studies. Average global temperatures have warmed by close to 1 degree Celsius (almost 1.8 degrees Fahrenheit) since the pre-industrial era. Much of the warming is due to human-produced emissions of greenhouse gases, predominantly carbon dioxide. This heat-trapping gas has increased from a pre-industrial level of about 284 parts per million (ppm) in the atmosphere to more than 380 ppm today. With research showing that additional warming of about 1 degree C (1.8 degrees F) may be the threshold for dangerous climate change, the European Union has called for dramatic cuts in emissions of carbon dioxide and other greenhouse gases. The U.S. Congress is also debating the issue. To examine the impact of such cuts on the world's climate, Washington and his colleagues ran a series of global supercomputer studies with the NCAR-based Community Climate System Model (CCSM). They assumed that carbon dioxide levels could be held to 450 ppm at the end of this century. That figure comes from the U.S. Climate Change Science Program, which has cited 450 ppm as an attainable target if the world quickly adopts conservation practices and new green technologies to cut emissions dramatically. In contrast, emissions are now on track to reach about 750 ppm by 2100 if unchecked. The team's results showed that if carbon dioxide were held to 450 ppm, global temperatures would increase by 0.6 degrees C (about 1 degree F) above current readings by the end of the century. In contrast, the study showed that temperatures would rise by almost four times that amount, to 2.2 degrees C (4 degrees F) globally above current observations, if emissions were allowed to continue on their present course (Figure 1). Holding carbon dioxide levels to 450 ppm would have other impacts, according to the climate modeling study: Sea level rise due to thermal expansion as water temperatures warmed would be 14 centimeters (about 5.5 inches) instead of 22 centimeters (8.7 inches). Significant additional sea level rise would be expected in either scenario from melting ice sheets and glaciers. Arctic ice in the summertime would shrink by about a quarter in volume and stabilize by 2100, as opposed to shrinking at least three-quarters and continuing to melt. Some research has suggested the summertime ice will disappear altogether this century if emissions continue on their current trajectory. Arctic warming would be reduced by almost half, helping preserve fisheries and populations of sea birds and Arctic mammals in such regions as the northern Bering Sea. Significant regional changes in precipitation, including decreased precipitation in the U.S. Southwest and an increase in the U.S. Northeast and Canada, would be cut in half if emissions were kept to 450 ppm (Figure 2). The climate system would stabilize by about 2100, instead of continuing to warm. The research team used supercomputer simulations to compare a business-as-usual scenario to one with dramatic cuts in carbon dioxide emissions beginning in about a decade. The authors stressed that they were not studying how such cuts could be achieved nor advocating a particular policy. "Our goal is to provide policymakers with appropriate research so they can make informed decisions," Washington says. "This study provides some hope that we can avoid the worst impacts of climate change—if society can cut emissions substantially over the next several decades and continue major cuts through the century."

### Prefer peer-reviewed experts and scientific consensus – climate deniers circumvent accountability and should be rejected

Lewandowsky, 6/20 - Australian Professorial Fellow, Cognitive Science Laboratories at University of Western Australia [Stephan, 6/20/2011, The Conversation, “Climate change denial and the abuse of peer review,”

On 20 April 2010, a BP oil rig exploded in the Gulf of Mexico, killing 11 workers and creating the largest oil spill in history. When President Obama sought to hold the corporation accountable by creating a $20B damage fund, this provoked Republican Congressman from Texas Joe Barton to issue a public apology. An apology not to the people affected by the oil spill … but to BP. In a peculiar inversion of ethics, Barton called the President’s measures a “shakedown”, finding it a “tragedy in the first proportion” that a corporation should be held accountable for the consequences of its actions. What does a Congressman’s inverted morality have to do with climate denial? Quite a bit. In a similar inversion of normal practice, most climate deniers avoid scrutiny by sidestepping the peer-review process that is fundamental to science, instead posting their material in the internet or writing books. Books may be impressively weighty, but remember that they are printed because a publisher thinks they can make money, not necessarily because the content has scientific value. Fiction sells, even if dressed up as science. During peer review, by contrast, commercial interests are removed from the publication decision because journals are often published by not-for-profit professional organizations. Even if private publishers are involved, they make their profit primarily via university subscriptions, and universities subscribe to journals based on their reputation, rather than based on individual publication decisions. Very occasionally a contrarian paper does appear in a peer-reviewed journal, which segments of the internet and the media immediately hail as evidence against global warming or its human causes, as if a single paper somehow nullifies thousands of previous scientific findings. What are we to make of that handful of contrarian papers? Do they make a legitimate if dissenting contribution to scientific knowledge? In some cases, perhaps. But in many other cases, troubling ethical questions arise from examination of the public record surrounding contrarian papers. For example, in 2003 the reputable journal Climate Research published a paleoclimatological analysis that concluded, in flat contradiction to virtually all existing research, that the 20th century was probably not the warmest of the last millennium. This paper, partially funded by the American Petroleum Institute, attracted considerable public and political attention because it seemingly offered relief from the need to address climate change. The paper also engendered some highly unusual fall-out. First, three editors of Climate Research resigned in protest over its publication, including the incoming editor-in-chief who charged that “…some editors were not as rigorous in the review process as is otherwise common.” This highly unusual mass resignation was followed by an even more unusual public statement from the publisher that acknowledged flaws in the journal’s editorial process. Three editorial resignations and a publisher’s acknowledgement of editorial flaws are not standard scientific practice and call for further examination of the authors and the accepting editor. The first author of this paper, Dr Willie Soon, is an astrophysicist by training. In U.S. congressional testimony, he identified his “training” in paleoclimatology as attendance at workshops, conferences, and summer schools. (The people who teach such summer schools, actual climate scientists, published a scathing rebuttal of Soon’s paper.) Undaunted, Dr Soon has since become an expert on polar bears, publishing a paper that accused the U.S. Geological Survey of being “unscientific” in its reports about the risks faced by polar bears from climate change. Most recently, Dr Soon has become an expert on mercury poisoning, using the Wall Street Journal as a platform to assuage fears about mercury-contaminated fish because, after all, “mercury has always existed naturally in Earth’s environment.” Lest one wonder what links paleoclimatology, Arctic ecology, and environmental epidemiology, the answer is not any conventional area of academic expertise but ideology. As Professor Naomi Oreskes and historian Erik Conway have shown in their insightful book, Merchants of Doubt, the hallmark of organized denial is that the same pseudo-experts emerge from the same shadowy “think” tanks over and over to rail against what they call “junk science”. Whether it is the link between smoking and lung cancer, between mercury and water poisoning, or between carbon emissions and climate change, ideology inverts facts and ethics whenever overwhelming scientific evidence suggests the need to regulate economic activity. So what of the editor who accepted the flawed Climate Research paper, Dr Chris de Freitas of Auckland? Later, De Freitas co-authored a paper in 2009 that some media outlets heralded as showing that climate change was down to nature. One of the authors, Adjunct academic Bob Carter from James Cook University, claimed that “our paper confirms what many scientists already know: which is that no scientific justification exists for emissions regulation.” Welcome news indeed, at least for the coal industry, but does the paper support this conclusion? No. For starters, the 2009 paper by McLean, de Freitas, and Carter did not address long-term global warming at all. It discussed the association between ocean currents and air temperature — in particular the time lag between the warm El Niño current and the ensuing increase in temperature. Indeed, the article does not even contain the words “climate change” except in a citation of the IPCC, and its only conceivable connection with climate change arises from the speculative phrase “ … and perhaps recent trends in global temperature …” in the final sentence. It appears ethically troubling to derive strong statements about emissions regulations from such a tentative clause in one’s final sentence in a paper on quite a different issue. Such statements appear even more troubling if one considers paragraph 14 of the paper, which reads, “to remove the noise, the absolute values were replaced with derivative values based on variations. Here the derivative is the 12-month running average subtracted from the same average for data 12 months later.” What happens to data if successive annual values are subtracted from each other? This mathematically removes any linear time trend. In other words, temperatures could have doubled every other year and it would have escaped detection by the authors. This removal of the trend did not escape detection by the scientific community, however, and the published rebuttal of this “it’s-all-natural” paper was as swift and devastating as it was for Dr Soon’s. To remove the linear trend from temperature data in a paper that does not address climate change, and to then claim that nature is responsible for global warming and there is no scientific basis for emissions regulations smacks of an inversion of scientific ethics and practice. Let us return to Congressman Barton. Before apologizing to BP, not for the nearly $3,000,000 he has received in contributions from the oil, gas, and energy industries, but for President Obama seeking accountability from the corporation, Mr Barton also sponsored a contrived investigation of the famed “hockeystick” paper by Professor Michael Mann and colleagues. The hockeystick is the iconic graph that shows the sky-rocketing temperatures of the last few decades in comparison to the relatively constant temperatures during the preceding centuries. The U.S. National Academy of Sciences affirmed the basic conclusions of Professor Mann, as have numerous other papers published during the last decade. Mr. Barton, however, relied on a report by a certain Professor Wegman, who claimed to have identified statistical flaws in the analysis underlying the original hockeystick. (Even if correct, that criticism has no bearing on the overall conclusion of Professor Mann’s paper or on the numerous independent hockeysticks produced by other researchers.) Professor Wegman subsequently published part of his report in the journal Computational Statistics and Data Analysis. Although normally a peer-reviewed journal, in this instance the paper was accepted a few days after submission, in July 2007, in an especially ironic twist as the paper tried to cast doubt on the quality of peer review in climate research. Alas, the paper’s lifetime was cut tragically short when it was officially withdrawn by the publisher a few weeks ago. Why? The paper by Wegman and colleagues was officially withdrawn because of substantial plagiarism. Conforming to the typical pattern of inversions, Wegman also appears to have plagiarized large parts of his initial hockeystick critique for Congressman Barton, while additionally distorting and misrepresenting many of the conclusions of the cited authors. We have examined just the tip of an iceberg of inversion of normal standards of ethics and scientific practice. These multiple departures from common scientific practice are not isolated incidents — on the contrary, they represent a common thread that permeates all of climate denial. Because climate denial is just that: denial, not scepticism. Science is inherently sceptical, and peer-review is the instrument by which scientific scepticism is pursued. Circumventing or subverting that process does not do justice to the public’s need for scientific accountability. At a time when Greenland is losing around 9,000 tonnes of ice every second — all of which contributes to sea level rises – it is time to hold accountable those who invert common standards of science, decency, and ethics in pursuit of their agenda to delay action on climate change.

### Models are good – more accurate than ever and improving

ScienceDaily, ‘8 [4/6/2008, “Climate Models Look Good When Predicting Climate Change,” ScienceDaily, http://www.sciencedaily.com/releases/2008/04/080402100001.htm, DS]

The accuracy of computer models that predict climate change over the coming decades has been the subject of debate among politicians, environmentalists and even scientists. A new study by meteorologists at the University of Utah shows that current climate models are quite accurate and can be valuable tools for those seeking solutions on reversing global warming trends. Most of these models project a global warming trend that amounts to about 7 degrees Fahrenheit over the next 100 years. In the study, co-authors Thomas Reichler and Junsu Kim from the Department of Meteorology at the University of Utah investigate how well climate models actually do their job in simulating climate. To this end, they compare the output of the models against observations for present climate. The authors apply this method to about 50 different national and international models that were developed over the past two decades at major climate research centers in China, Russia, Australia, Canada, France, Korea, Great Britain, Germany, and the United States. Of course, also included is the very latest model generation that was used for the very recent (2007) report of the Intergovernmental Panel on Climate Change (IPCC). "Coupled models are becoming increasingly reliable tools for understanding climate and climate change, and the best models are now capable of simulating present-day climate with accuracy approaching conventional atmospheric observations," said Reichler. "We can now place a much higher level of confidence in model-based projections of climate change than in the past." The many hours of studying models and comparing them with actual climate changes fulfills the increasing wish to know how much one can trust climate models and their predictions. Given the significance of climate change research in public policy, the study's results also provide important response to critics of global warming. Earlier this year, working group one of the IPCC released its fourth global warming report. The University of Utah study results directly relate to this highly publicized report by showing that the models used for the IPCC paper have reached an unprecedented level of realism. Another important aspect of the research is that climate models built in the U.S. are now some of the best models worldwide. Increased efforts in the U.S. over the past few years to build better climate models have paid off, and according to the authors' measure of reliability, one of the U.S. models is now one of the leading climate models worldwide.

## 1AC Heg Advantage

### Contention \_\_\_ is Hegemony

### Scenario 1 is Readiness:

### Oil dependence overextends US military and kills readiness

Wald et al 9 (General Charles F Wald, Former Deputy Commander, Headquarters U.S. European Command, General Gordon R. Sullivan, Former Chief of Staff, U.S. Army, and Former Chairman of the CNA MAB, Vice Admiral Richard H. Truly, Former NASA Administrator, Shuttle Astronaut and the ﬁrst Commander of the Naval Space Command, “Powering America’s Defense,” May 2009. <http://www.cna.org/sites/default/files/Powering%20Americas%20Defense.pdf>)

In the U.S., dependence on foreign oil has had a marked impact on national security policies. Much of America’s foreign and defense policies have been deﬁned, for nearly three decades, by what came to be known as the Carter Doctrine. In his State of the Union address in January 1980, not long after the Soviet Union invaded Afghanistan, President Jimmy Carter made it clear that the Soviets had strayed into a region that held “great strategic importance” [33]. He said the Soviet Union’s attempt to consolidate a position so close to the Straits of Hormuz posed “a grave threat to the free movement of Middle East oil.” He then made a declaration that went beyond a condemnation of the Soviet invasion by proclaiming the following: Dependence on foreign oil has had a marked impact on national security policies. The MEND claims it operates to ﬁght environmental and human rights abuses by multinational oil companies and the Nigerian government; critics describe the group as criminal gangs extorting money from oil companies operating in the region [30]. Our aim is not to argue for or against the cause of the MEND, but instead to characterize the impacts these types of groups can have on oil production in unstable regions.PoweringAmericasDefense.org—7 An attempt by any outside force to gain control of the Persian Gulf region will be regarded as an assault on the vital interests of the United States of America, and such an assault will be repelled by any means necessary, including military force. When President Carter made his declaration, the U.S. imported roughly 40 percent of its oil. While the U.S.’s dependence on imported oil dipped below 30 percent in the early 1980s, that percentage has since doubled. In fact, due to the increase in U.S. demand, the total annual volume of oil imported into the U.S. has tripled since the early 1980s [34]. As a result, the stakes are higher, and the U.S. has accordingly dedicated an enormous military presence to ensure the unimpeded ﬂow of oil—in the Persian Gulf and all across the globe. Our Commanders-in-Chief chose this mission not because they want America to be the world’s oil police; they did so because America’s thirst for oil leaves little choice. Inefﬁcient use and overreliance on oil burdens the military, undermines combat effectiveness, and exacts a huge price tag—in dollars and lives.

### The DoD is dependent in the status quo-Oil collapse kills the Military and US power projection

Thomas & Kerner 10 (Scott Thomas Ph.D, David Kerner, Writers at the Strategic Studies Institute in the US army War College, Defense Energy Resilience: Lessons from Ecology”, http://www.strategicstudiesinstitute.army.mil/pdffiles/PUB1011.pdf, August 2010) SV

While U.S. energy needs are currently being met, the shrinking gap between global supply of and demand for energy draws the world closer to an energy competition tipping point at which human behavior becomes less predictable, social and geopolitical normalizing forces are overwhelmed, and conflict becomes likelier and more pronounced. Moreover, energy resource uncertainty degrades DoD mission planning confidence. For example, if a series of blockades, embargoes, labor strikes, and/or military attacks suddenly shut down the global oil supply network, reserve stores of petroleum and petroleum-based fuels would dwindle quickly—particularly during wartime operations— leaving the U.S. military unable to obtain suitable alternative fuels and rendering it virtually immobile. 14 This situation would last as long as it took to restart and deliver supplies of current fuels, or to replace them with suitable alternatives, both of which could take months, if not years. In fact, not much of a perturbation is needed to cause havoc. Even a gradual reduction in oil-based fuel supply—perhaps over a period of months or a few years—would outpace any foreseeable program to develop suitable replacements, thus greatly reducing the mobility of our oildependent military and altering our national security stance. In this event, planning assumptions regarding national security and power projection would require hasty reconsideration. The problem is not just that DoD uses so much energy; it is that DoD relies heavily on a very limited selection of energy resources and is thus extremely vulnerable to vagaries of supply. Moreover, defense planning proceeds as though oil supplies are limitless. Even within wargaming scenarios, imposed limits on oil supply that are designed to test the effect of scarcity on military function typically assume that those limits are merely temporary disruptions, rather than long-term or permanent shortfalls. The assumption of unlimited oil, available whenever and in whatever form it is needed, contributes to an energy myopia that has left DoD systemically calcified and inadequately prepared to employ other energy sources. If DoD does not improve its energy flexibility and routinize its use of alternate energy resources, even small fluctuations in the cost and availability of its current fuels may have a magnified and possibly overwhelming effect on mission capabilities. An incident such as the obstruction of even a single critical oil transport route would quickly create a man-made global shortage and force global powers to prioritize their use of this critical resource. As the world’s largest consumer of oil— the United States has less than 5 percent of the world’s population but consumes about one-quarter of the world’s oil output it would have to choose between its health, emergency services, agriculture, home heating, transportation, industrial, defense, and other sectors in allotting what oil it could obtain. Given this internal competition for the resource, the military may well face diminished supplies, causing reduced capabilities and a more vulnerable defense posture around the globe. In summary, DoD’s energy security is entering a period of increased unpredictability and complexity, one for which previous approaches to solutions are no longer adequate. DoD would be best served by an energy strategy featuring sustainability, resilience, and adaptability to evolving conditions, a strategy derived from the fields of ecology and natural resource management. We will explore the theory behind these concepts, and then ground the theory with (1) discussion of how it applies to managing military energy security, and (2) an action plan for achieving more resilience in energy security.

### And, geographic flexibility and rapid force deployments are critical to US hard power.

Crowley et al 07 (Thomas, president- Peabody & Associates, Inc., an economic consulting firm that specializes in solving economic, transportation, marketing, and fuel supply problems, TRANSFORMING THE WAY DOD LOOKS AT ENERGY AN APPROACH TO ESTABLISHING AN ENERGY STRATEGY, April, http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA467003)

Recent experience indicates that the nature of the threat facing the United States is changing. Today, we cannot be sure in advance of the location of future conflicts, given the threat of dispersed, small-scale attacks inherent in warfare with rogue nations and insurgent forces. In addition, the U.S. military must be prepared to defend against single strikes capable of mass casualties. This complex security environment—an environment in which a wide range of conventional and unconventional attacks can come from unpredictable regions of the world and the risk of a single attack is high—requires the United States not only to maintain a force that is forward and engaged on a daily steady-state basis, but also to ensure that it is ready for quick, surge deployments worldwide to counter, and deter, a broad spectrum of potential threats. Department-wide and service-specific strategy documents have identified solutions to navigating in this new environment. The solutions have three general themes (described in Appendix B): 􀂡 Theme 1. Our forces must expand geographically and be more mobile and expeditionary so that they can be engaged in more theaters and prepared for expedient deployment anywhere in the world. 􀂡 Theme 2. We must transition from a reactive to a proactive force posture to deter enemy forces from organizing for and conducting potentially catastrophic attacks. 􀂡 Theme 3. We must be persistent in our presence, surveillance, assistance, and attack to defeat determined insurgents and halt the organization of new enemy forces. To carry out these activities, the U.S. military will have to be even more energy intense, locate in more regions of the world, employ new technologies, and manage a more complex logistics system. Considering the trend in operational fuel consumption and future capability needs, this “new” force employment construct will likely demand more energy/fuel in the deployed setting. Simply put, more miles will be traveled, both by combat units and the supply units that sustain them, which will result in increased energy consumption. Therefore, DoD must apply new energy technologies that address alternative supply sources and efficient consumption across all aspects of military operations.

### Even if Oil isn’t going to collapse now-Action is necessary to ensure long term stability

Parthemore & Nagl 10 (Christine Parthemore, Fellow at the Center for New American Security, John Nagl, President of the Center for New American Security, “Fueling the Future Force: Preparing the Department of Defense for a Post-Petroleum Era”, http://www.cnas.org/node/5023, September 2010) SV

Despite the timeline, **DOD does not have several decades to begin this transition**. The renewable fuel development, testing and evaluation that the services have conducted to date mark the first steps in guaranteeing their long-term ability to meet their energy needs, but even if DOD adopts a hastened timeline, it will take decades to complete this transition. **Implementing this** strategy **must** therefore **begin immediately.**

### American hegemony is necessary to prevent a multitude of conflicts in every region of the world – a multipolar world would not solve global problems, but would only increase the likelihood of war

Kagan 7 [Robert, a senior associate at the Carnegie Endowment for International Peace and transatlantic fellow at the German Marshall Fund, “End of Dreams, Return of History, 6-19, http://www.realclearpolitics.com/articles/2007/07/end\_of\_dreams\_return\_of\_histor.html]

The jostling for status and influence among these ambitious nations and would-be nations is a second defining feature of the new post-Cold War international system**. Nationalism in all its forms is back**, if it ever went away, and so is international competition for power, influence, honor, and status. **American predominance prevents these rivalries from intensifying -- its regional as well as its global predominance**. Were the United States to diminish its influence in the regions where it is currently the strongest power, the other nations would settle disputes as great and lesser powers have done in the past: sometimes through diplomacy and accommodation but often **through confrontation and wars** of varying scope, intensity, and destructiveness. One novel aspect of such a multipolar world is that most of these powers would possess **nuclear weapons**. That could make wars between them less likely, or it could simply make them **more catastrophic**. It is easy but also dangerous to underestimate the role the United States plays in providing a measure of stability in the world even as it also disrupts stability. For instance, the United States is the dominant naval power everywhere, such that other nations cannot compete with it even in their home waters. They either happily or grudgingly allow the United States Navy to be the guarantor of international waterways and trade routes, of international access to markets and raw materials such as oil. Even when the United States engages in a war, it is able to play its role as guardian of the waterways. In a more genuinely multipolar world, however, it would not. Nations would compete for naval dominance at least in their own regions and possibly beyond. Conflict between nations would involve struggles on the oceans as well as on land. Armed embargos, of the kind used in World War i and other major conflicts, **would disrupt trade flows in a way that is now impossible**. Such order as exists in the world rests not merely on the goodwill of peoples but on a foundation provided by American power. Even the European Union, that great geopolitical miracle, owes its founding to American power, for without it the European nations after World War ii would never have felt secure enough to reintegrate Germany. Most Europeans recoil at the thought, but even today Europe 's stability depends on the guarantee, however distant and one hopes unnecessary, that the United States could step in to check any dangerous development on the continent. In a genuinely multipolar world, that would not be possible without **renewing the danger of world war**. People who believe greater equality among nations would be preferable to the present American predominance often succumb to a basic logical fallacy. They believe the order the world enjoys today exists independently of American power. They imagine that in a world where American power was diminished, the aspects of international order that they like would remain in place. But **that 's not the way it works**. International order does not rest on ideas and institutions. It is shaped by configurations of power. The international order we know today reflects the distribution of power in the world since World War ii, and especially since the end of the Cold War. A different configuration of power, a multipolar world in which the poles were Russia, China, the United States, India, and Europe, would produce its own kind of order, with different rules and norms reflecting the interests of the powerful states that would have a hand in shaping it. Would that international order be an improvement? Perhaps for Beijing and Moscow it would. But it is doubtful that it would suit the tastes of enlightenment liberals in the United States and Europe. The current order, of course, is not only far from perfect but also offers no guarantee against major conflict among the world 's great powers. Even under the umbrella of unipolarity, regional conflicts involving the large powers may erupt. War could erupt between China and Taiwan and draw in both the United States and Japan. War could erupt between Russia and Georgia, forcing the United States and its European allies to decide whether to intervene or suffer the consequences of a Russian victory. Conflict between India and Pakistan remains possible, as does conflict between Iran and Israel or other Middle Eastern states. These, too, could draw in other great powers, including the United States. Such conflicts may be unavoidable no matter what policies the United States pursues. But they are more likely to erupt if the United States weakens or withdraws from its positions of regional dominance. This is especially true in East Asia, where most nations agree that a reliable American power has a stabilizing and pacific effect on the region. That is certainly the view of most of China 's neighbors. But even China, which seeks gradually to supplant the United States as the dominant power in the region, faces the dilemma that an American withdrawal could unleash an ambitious, independent, nationalist Japan. In Europe, too, the departure of the United States from the scene -- even if it remained the world's most powerful nation -- could be destabilizing. It could tempt Russia to an even more overbearing and potentially forceful approach to unruly nations on its periphery. Although some realist theorists seem to imagine that the disappearance of the Soviet Union put an end to the possibility of confrontation between Russia and the West, and therefore to the need for a permanent American role in Europe, history suggests that conflicts in Europe involving Russia are possible even without Soviet communism. If the United States withdrew from Europe -- if it adopted what some call a strategy of "offshore balancing" -- this could in time **increase the likelihood of conflict** involving Russia and its near neighbors, which could in turn draw the United States back in under unfavorable circumstances. It is also optimistic to imagine that a retrenchment of the American position in the Middle East and the assumption of a more passive, "offshore" role would lead to greater stability there. The vital interest the United States has in access to oil and the role it plays in keeping access open to other nations in Europe and Asia make it unlikely that American leaders could or would stand back and hope for the best while the powers in the region battle it out. Nor would a more "even-handed" policy toward Israel, which some see as the magic key to unlocking peace, stability, and comity in the Middle East, obviate the need to come to Israel 's aid if its security became threatened. That commitment, paired with the American commitment to protect strategic oil supplies for most of the world, practically ensures a heavy American military presence in the region, both on the seas and on the ground. The subtraction of American power from any region would not end conflict but would simply change the equation. In the Middle East, competition for influence among powers both inside and outside the region has raged for at least two centuries. The rise of Islamic fundamentalism doesn 't change this. It only adds a new and more threatening dimension to the competition, which neither a sudden end to the conflict between Israel and the Palestinians nor an immediate American withdrawal from Iraq would change. **The alternative to American predominance** in the region **is not balance and peace**. It is further competition. The region and the states within it remain relatively weak. A diminution of American influence would not be followed by a diminution of other external influences. One could expect deeper involvement by both China and Russia, if only to secure their interests. 18 And one could also expect the more powerful states of the region, particularly Iran, to expand and fill the vacuum. It is doubtful that any American administration would voluntarily take actions that could shift the balance of power in the Middle East further toward Russia, China, or Iran. The world hasn 't changed that much. An American withdrawal from Iraq will not return things to "normal" or to a new kind of stability in the region. It will produce a new instability, one likely to draw the United States back in again. The alternative to American regional predominance in the Middle East and elsewhere is not a new regional stability. In an era of burgeoning nationalism, the future is likely to be one of intensified competition among nations and nationalist movements. Difficult as it may be to extend American predominance into the future**, no one should imagine that a reduction of American power or a retraction of American influence and global involvement will provide an easier path**.

### Scenario 2 is the DoD’s Budget:

### The current Petroleum budget diverts funds in the DOD

Parthemore & Nagl 10 (Christine Parthemore, Fellow at the Center for New American Security, John Nagl, President of the Center for New American Security, “Fueling the Future Force: Preparing the Department of Defense for a Post-Petroleum Era”, http://www.cnas.org/node/5023, September 2010) SV

The Department of Defense accounts for about 80 percent of the federal government's energy consumption, and its high dependence on petroleumbased fuels – the Defense Energy Support Center reported 132.5 million barrels in petroleum sales in fiscal year 2008, totaling nearly **18 billion dollars**13 – means that its budget is subject to major oil price fluctuations.14 **Petroleum price spikes negatively affect DOD’s budget and divert funds that could be used for more important purposes**. As Secretary Gates said in 2008, “Every time the price of oil goes up by 1 dollar per barrel, it costs us about 130 million dollars.”15 In an era of constrained budgets, American security is best served by trying to hedge against future price fluctuations of this scale. In addition to the security and financial costs, petroleum dependence creates environmental costs that are causing increasing concern among security analysts. Emissions from fossil fuel use contribute to changes in the global climate, which risk altering geopolitical relations, destabilizing regions of high strategic importance to the United States, increasing erosion and storm surges at coastal installations, and altering disease patterns.16 Melting summer ice in the Arctic is an early example; its geopolitical importance has risen sharply in the past five years as Arctic countries (and their potential shipping and natural resource customers) prepare to exploit newly navigable waterways and seabed resource deposits. Federal leaders from both major political parties, DOD’s civilian and military leaders, and security analysts of all stripes regularly reiterate concerns over the national security implications of the changing climate caused by high-carbon fuel consumption.17 Other environmental costs of fuel production can include heavy water use and diverting arable land to fuel production, both of which can trigger negative side effects if not managed properly. Factors such as greenhouse gas emissions (including from burning high-carbon fuels and from land use change) and the effects of fuel production on food prices should therefore constrain DOD’s energy investments in high-carbon fossil fuels or first-generation biofuels derived from food crops.

### New money would go toward Modernization and readiness-they’re the DoD’s top priority

Flowers and Thomas 2/14 (Major General Alfred – Deputy Assistant Secretary for Budget, US Air Force, and Marilyn – Deputy fr Budget to General Flowers, “DOD Briefing on the Fiscal 2012 Budget Proposal,” DoD News Transcript, 2/14/11. <http://www.defense.gov/transcripts/transcript.aspx?transcriptid=4773>)

I know the purpose of this is primarily the FY '12 budget. But before we get into the FY '12 budget, I want to take this opportunity to just reemphasize what you've heard from all the previous briefers this afternoon. And the fact is that we're still operating without an appropriations bill in FY '11. And that's creating some challenges for us that we had not anticipated, but we're managing. This -- operating without an appropriations bill is limiting flexibility to respond to emerging requirements. It restricts us from new START and production increases in investment programs. It's deferring -- causing us to defer military construction projects. By the end of this CR period, the 4th of March, we will have deferred 36 military construction projects with scheduled award dates through the beginning of March. If we go under a traditional CR all year, we will defer up to 75 projects, another 39. So we are doing some things that we need to stop doing that will create some byways for us into FY '12, some things that contribute to inefficient execution in FY '11 that's driving increased costs, and that byways requirements into -- will bow wave requirements into FY '12. Our secretary and chiefs' priorities are very clear. The guidance as we started to build this budget was to ensure that we balanced investments across core functions and focus on combat-enabling capabilities for the warfighters in the joint coalition fight. The priorities have not changed from those of FY '11, and they are -- as you see, they are -- we continue to strengthen the nuclear enterprise. Included in this budget is $5.2 billion towards continuing to strengthen the nuclear enterprise. We're continuing to partner with the joint coalition team to win today's fight. Develop and care for airmen and their families. Included in this budget is $813 million for family programs. Modernize our air, space, and cyberspace inventories, organizations and training. Recapture acquisition excellence.

### Funding is key curtail Air Force collapse

Brannen, Cavas & Majumdar 11 (Kate, Christopher and Dave, staff writers for the Federal Times, “2011 Budget delay causes issues for Defense Department,” Federal Times, 2/6/11. <http://www.federaltimes.com/article/20110206/DEPARTMENTS01/102060304/>)

The delays and uncertainty are causing all sorts of problems throughout the military services. For example, Air Force leaders worry they will run out of money to pay troops. The Air Force's military personnel budget is $1.2 billion short, and the operations and maintenance budget is facing a $4.6 billion deficit. "If we don't get some degree of relief, as the Congress continues its work, those will impose significant real implications on Air Force operations," said Jamie Morin, assistant Air Force secretary for financial management. Morin said the service is operating under a $7 billion shortfall compared with the White House budget request. The service also is hamstrung when it comes to awarding new contracts, increasing production rates for needed equipment, or funding military construction projects, he said. A bow wave of deferred aircraft maintenance, facility maintenance and military health care costs is building up as the service operates under constraints of the continuing resolution. Air Force Vice Chief Gen. Philip Breedlove said in a Feb. 3 e-mail that the CR "has negatively affected Air Force modernization programs. Production rate increases and new production — which includes military construction — have been prohibited." He added that day-to-day operations are constrained. "Funding shortfalls in military pay and health care will affect training and readiness," he said. The Air Force has responded by shifting around what funds it can under the law, but the service is running out of room to maneuver. "Our ability to mitigate is basically fully used up now," Morin said. The service had been raiding procurement accounts to stave off a breakdown, but those funds are running dry, said Maj. Gen. Alfred Flowers, the Air Force's deputy assistant secretary for budget. The result is that deployed troops are not getting the equipment they need, Morin said. Morin said one example was the MQ-9 Reaper unmanned aircraft. Under the proposed 2011 budget, the Air Force was planning to purchase 48 Reapers this year as it attempts to increase the number of combat air patrols in Afghanistan to 65 orbits. However, Morin said, the Air Force is prohibited from buying more than 24 aircraft because of the budget impasse. "Which means we're going to delay getting capability to Afghanistan," he said. Another program affected is the F-15E active electronically scanned array radar upgrade, Morin said. If the contract for the upgrade is not awarded this year, the service may have to ground the aircraft "down the road" as spare parts are no longer available for their current radar sets. If a budget is not passed at all this year, the impact will also be felt by the F-15C fleet, which is also receiving new radar. Flowers said other affected programs include GPS satellites, the Joint Air-to-Surface Standoff Missile, Joint Strike Fighter, new tanker and the Wideband Global SATCOM system, among others.

### The Air power is the only successful way of deterring aggression and terrorism

Dunlap 6 (Major General Charles Jr, Armed Forces Journal, http://www.afji.com/2006/09/2009013, September 2006)

So where does that leave us? If we are smart, we will have a well-equipped high-technology air power capability. Air power is America's asymmetric advantage and is really the only military capability that can be readily applied across the spectrum of conflict, including, as is especially important these days, potential conflict. Consider the record. It was primarily air power, not land power, that kept the Soviets at bay while the U.S. won the Cold War. And it was not just the bomber force and the missileers; it was the airlifters, as well. There are few strategic victories in the annals of military history more complete and at so low a human cost as that won by American pilotsduring the Berlin airlift. Armageddon was avoided. And the flexibility and velocity of air power also provides good-news stories in friendly and low-threat areas. For example, huge U.S. transports dropping relief supplies or landing on dirt strips in some area of humanitarian crisis get help to people on a timeline that can make a real difference. Such operations also illustrate, under the glare of the global media, the true American character the world needs to see more often if our strategic goals are to be achieved. Air power also doesn't have the multi-aspect vulnerabilities that boots on the ground do. It can apply combat power from afar and do so in a way that put**s** few of our forces at risk. True, occasionally there will be a Francis Gary Powers, and certainly the Vietnam-era POWs — mostly airmen — became pawns for enemy exploitation. Yet, if America maintains its aeronautical superiority, the enemy will not be able to kill 2,200 U.S. aviators and wound another 15,000, as the ragtag Iraqi terrorists have managed to do to our land forces. And, of course, bombs will go awry. Allegations will be made (as they are currently against the Israelis) of targeting civilians and so forth. But the nature of the air weapon is such that an Abu Ghraib or Hadithah simply cannot occur. The relative sterility of air power — which the boots-on-the-ground types oddly find distressing as somehow unmartial — nevertheless provides greater opportunity for the discreet application of force largely under the control of well-educated, commissioned officer combatants. Not a total insurance policy against atrocity, but a far more risk-controlled situation. Most important, however, is the purely military effect. The precision revolution has made it possible for air power to put a bomb within feet of any point on earth. Of course, having the right intelligence to select that point remains a challenge — but no more, and likely much less so, than for the land forces. The technology of surveillance is improving at a faster rate than is the ability to conceal. Modern conveniences, for example, from cell phones to credit cards, all leave signatures that can lead to the demise of the increasing numbers of adversaries unable to resist the siren song of techno-connection. Regardless, eventually any insurgency must reveal itself if it is to assume power, and this inevitably provides the opportunity for air power to pick off individuals or entire capabilities that threaten U.S. interests. The real advantage — for the moment anyway — is that air power can do it with impunity and at little risk to Americans. The advances in American air power technology in recent years make U.S. dominance in the air intimidating like no other aspect of combat power for any nation in history. The result? Saddam Hussein's pilots buried their airplanes rather than fly them against American warplanes. Indeed, the collapse of the Iraqi armed forces was not, as the BOTGZ would have you believe, mainly because of the brilliance of our ground commanders or, in fact, our ground forces at all. The subsequent insurgency makes it clear that Iraqis are quite willing to take on our ground troops. What really mattered was the sheer hopelessness that air power inflicted on Iraq's military formations. A quotation in Time magazine by a defeated Republican Guard colonel aptly captures the dispiriting effect of high-tech air attack: "[Iraqi leaders] forgot that we are missing air power. That was a big mistake. U.S. military technology is beyond belief." It is no surprise that the vaunted Republican Guard, the proud fighting organization that tenaciously fought Iran for years, practically jumped out of their uniforms and scattered at the sound of approaching U.S. aircraft. This same ability to inflict hopelessness was even more starkly demonstrated in Afghanistan. For a millennium, the Afghans have been considered among the toughest fighters in the world. Afghan resistance has turned the countryside into a gigantic military cemetery for legions of foreign invaders. For example, despite deploying thousands of troops, well-equipped Soviet forces found themselves defeated after waging a savage war with practically every weapon at their disposal. So what explains the rapid collapse of the Taliban and al-Qaida in 2001? Modern air power. More specifically, the marriage of precision weapons with precise targeting by tiny numbers of Special Forces troops on the ground. The results were stunning. Putatively invulnerable positions the Taliban had occupied for years literally disappeared in a rain of satellite-directed bombs from B-1s and B-52s flying so high they could be neither seen nor heard. This new, high-tech air power capability completely unhinged the resistance without significant commitment of American boots on the ground. Indeed, the very absence of American troops became a source of discouragement. As one Afghan told the New York Times, "We pray to Allah that we have American soldiers to kill," adding disconsolately, "These bombs from the sky we cannot fight." Another equally frustrated Taliban fighter was reported in the London Sunday Telegraph recently as fuming that "American forces refuse to fight us face to face," while gloomily noting that "[U.S.] air power causes us to take heavy casualties." In other words, the Taliban and al-Qaida were just as tough as the mujahideen who fought the Russians, and more than willing to confront U.S. ground forces, but were broken by the hopelessness that American-style air power inflicted upon them. MORE THAN BOMBS Today it is more than just bombing with impunity that imposes demoralization; it is reconnoitering with impunity. This is more than just the pervasiveness of Air Force-generated satellites. It also includes hundreds of unmanned aerial vehicles that are probing the landscape in Iraq and Afghanistan. They provide the kind of reliable intelligence that permits the careful application of force so advantageous in insurgency and counterterrorism situations. The insurgents are incapable of determining where or when the U.S. employs surveillance assets and, therefore, are forced to assume they are watched everywhere and always. The mere existence of the ever-present eyes in the sky no doubt inflicts its own kind of stress and friction on enemy forces.

### And, New energy technologies are key to solving all these internal links to heg.

Crowley et al 07 (Thomas, president- Peabody & Associates, Inc., an economic consulting firm that specializes in solving economic, transportation, marketing, and fuel supply problems, TRANSFORMING THE WAY DOD LOOKS AT ENERGY AN APPROACH TO ESTABLISHING AN ENERGY STRATEGY, April, http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA467003)

A successful transformation in how DoD views, values, and uses energy will provide a powerful catalyst for 21st century operations at all levels of the department. The 2005 DoD National Defense Strategy and the 2006 QDR call for increasing U.S. military presence globally, rather than locating en masse at static operating bases. This theme represents a “new global posture” in which smaller, joint bases, including joint expeditionary sea bases and cooperative security locations, are distributed globally and can reposition with ease in response to threats. Establishing such a posture requires forces in more regions of the world, employs new technologies, and creates a more complex logistics burden. Under current consumption patterns, such a strategy will be even more energy intensive at a time when availability of traditional energy resources is becoming increasingly questionable. The application of new operational concepts and energy technologies that address efficient use of energy and alternative supply sources increases the opportunity to achieve the vision of the National Defense Strategy. Increasing the energy efficiency of DoD operations has the potential to increase operational flexibility by reducing logistics support requirements, while freeing resources currently dedicated to energy and associated support for recapitalization purposes. The proposed option to expand the energy consumption mandates for federal facilities to mobility operations presents opportunities for significant savings. Our analysis, described in Appendix G, indicates that this move could result in cumulative savings to DoD of roughly $43 billion by 2030 based on Energy Information Agency reference case price projections (with a range between $26 billion and $73 billion for “low” and “high” price cases). This estimate does not include the secondary savings from the multiplier effects of reducing energy consumption. While investment would likely be required to achieve these savings, the investment would be offset by the multiplier effect, which is typically larger than the associated fuel cost. An energy transformation that leverages process change in the short term and technological innovation in the mid to long terms will provide DoD the opportunity to address the strategic, operational, fiscal, and environmental disconnects inherent in its current energy use and policies. Energy transformation will enable DoD to target its greatest energy challenges and focus change efforts on addressing them. Incorporating new energy-efficient concepts and technologies increases the potential to enhance operational effectiveness through increased reach and agility while reducing the logistics dependence of the force. From a fiscal perspective, reduction in the energy use profile will allow DoD to redirect resources formerly spent on fuel to increase investment in warfighting capability. Improved energy efficiency will also reduce DoD’s fiscal vulnerability to supply and price shocks in the energy market. More efficient use of energy and the choice of alternative energy options which minimize or mitigate environmental impact will garner the support of the public while acting in concert with national environmental goals. Through the process of energy transformation, DoD can become a national leader in innovative and efficient uses of energy, with the potential to alter the energy landscape by changing energy demand patterns and the associated energy security requirements. To implement these important changes, an effective managing body in DoD is required. This will allow DoD to coordinate the development of opportunities across the DoD and civilian agencies to minimize redundancy and to maximize complementarities; minimize suboptimization across the organization; and establish goals, metrics, and reporting requirements for energy efficiency. In view of the long period required to develop and populate the force with new concepts and capabilities, DoD should begin now to posture the force for success in an environment of increasing energy uncertainty.

## 1AC Solvency Contention

### SBSP is technologically feasible and can quickly become operational.

Whitesides ’08 (Loretta Hidalgo, Staff Writer for Wired Science. “Researchers Beam ‘Space’ Solar Power in Hawaii”. http://www.wired.com/wiredscience/2008/09/visionary-beams/. September 12, 2008) AP

The key to our energy future may be in space. A new long-range energy transmission experiment opens the possibility of sending solar energy from space to earth. Former NASA executive and physicist John Mankins captured solar energy from a mountain top in Maui and beamed it 92 miles to the main island of Hawaii. Tonight at 10 pm Discovery Channel will air an episode of Project Earth on the recent first-of-its-kind experiment. This long range demonstration of wireless power transmission was also a key step toward space-based solar power satellites. The team also beamed the power almost 100 times farther than NASA’s major 1970’s power transmission in the Mojave Desert in California. Although the amount of power sent, 20 watts, is barely enough to power a small compact fluorescent light bulb, and most of it was lost in transmission, the system was limited by the budget not the physics. If they had been able to afford more solar panels, more phased array transmitters and a better receivers (the one they had could only receive in the horizontal direction), Mankins claims they could do much better– possibly up to 64% efficiency. The Discovery Channel-sponsored experiment was executed with the support of scientists in Japan, Texas and California and showed that real progress could be made toward space-based solar power satellites in less than 5 months with less than $1 million. Their concept also uses mirrors to focus as much solar power as possible on the solar cells. The Discovery Channel’s teaser boasts that they were able to get five times more electricity than conventional solar cells. The high winds, high altitude helicopter monitoring, and the need to pack up the whole rig every night to honor the sacred ground on Haleakala will probably make for some great TV tonight. More exciting than the drama though is the implication for our energy future. The 120 gigawatts of solar power hitting the planet every second is more than all of human kind has used since the dawn of the industrial era. In space, you can tap into that without having to worry about losses in efficiency from the atmosphere, clouds or night. The space program seems like it could lead to a very tangible benefit, as tangible as global communications satellites and weather tracking satellites were to the previous generation. Image what living on the gulf coast would be like without our armada of weather satellites. "We need a short, mid and long range plan for energy," said Former Florida Congressman Paul Rancatore at a press conference this morning. Lately you’ve heard a lot of people talk about drilling, he added, "Don’t be focused on drilling down, focus on drilling up." Mankins says we can get a demonstration system in orbit in 6-7 years and could have a full scale operation system up in 10-15 years. It has the ring of being part of an, "Apollo-like program for energy." Most interestingly, the satellites could be very small and would work by being bundled together allowing economies of scale that we have not yet seen in space. U.S. factories could manufacture lots of identical satellite units and maybe even become a "net exporter of energy," claimed National Space Society Senior Vice President Mark Hopkins. When asked if he thought the future would be all space based solar power Mankins reasonably answered, "No, I think we need to maintain a portfolio of energy options. Using wind and other renewables in combination with space based solar power."

### And, the US is key- nobody can compete with NASA’s resources, tech, and knowledge Costa 10 (Rebecca, sociobiologist and expert in emerging trends in relationship to human evolution, global markets, and new technologies, former CEO of Silicon Valley start-up Dazai Advertising, Inc., “Can NASA Save a Struggling America?”, 10-1-10, http://cleantechnica.com/2010/11/01/can-nasa-save-struggling-america/) OP

As China takes the market for solar and wind technology right out of the hands of the DOE (just ask any venture capital firm specializing in clean tech – the writing is on the wall), NASA stands ready for a new mission: to leap-frog the worldwide hunt for renewable energy by initiating a full-scale space-based solar program. We have the technology, we have the resources, we have the need and the will – now all we need is for the Oval Office to run with it. No country has a space agency more knowledgeable, powerful or successful than NASA and the time has come for the United States to leverage this untapped asset. Forget investing in more nuclear power plants or trying to manufacture solar panels and wind generators more cheaply than China. When you can’t compete nose to nose there’s only one thing left to do: change the playing field. And in this case, America owns the field.

**SSP better than every other alternative.**

**NSS 07** (National Space Society, Space Solar Power Limitless clean energy from space, About Space Solar Power (SSP, also known as Space-Based Solar Power, or SBSP):, http://www.nss.org/settlement/ssp/, grubbs)

Advantages of Space Solar Power Unlike oil, gas, ethanol, and coal plants, space solar power does not emit greenhouse gases. Unlike coal and nuclear plants, space solar power does not compete for or depend upon increasingly scarce fresh water resources. Unlike bio-ethanol or bio-diesel, space solar power does not compete for increasingly valuable farm land or depend on natural-gas-derived fertilizer. Food can continue to be a major export instead of a fuel provider. Unlike nuclear power plants, space solar power will not produce hazardous waste, which needs to be stored and guarded for hundreds of years. Unlike terrestrial solar and wind power plants, space solar power is available 24 hours a day, 7 days a week, in huge quantities. It works regardless of cloud cover, daylight, or wind speed. Unlike nuclear power plants, space solar power does not provide easy targets for terrorists. Unlike coal and nuclear fuels, space solar power does not require environmentally problematic mining operations. Space solar power will provide true energy independence for the nations that develop it, eliminating a major source of national competition for limited Earth-based energy resources. Space solar power will not require dependence on unstable or hostile foreign oil providers to meet energy needs, enabling us to expend resources in other ways. Space solar power can be exported to virtually any place in the world, and its energy can be converted for local needs — such as manufacture of methanol for use in places like rural India where there are no electric power grids. Space solar power can also be used for desalination of sea water. Space solar power can take advantage of our current and historic investment in aerospace expertise to expand employment opportunities in solving the difficult problems of energy security and climate change. Space solar power can provide a market large enough to develop the low-cost space transportation system that is required for its deployment. This, in turn, will also bring the resources of the solar system within economic reach.

# \*\*\*Oil Advantage\*\*\*

## \*\*\*General Solvency\*\*\*

## SBSP solves Oil

### SBSP could replace all oil

Garretson ’09 (Peter, the chief, future science and technology exploration, for the U.S. Air Force. He has studied advanced space and energy concepts for the U.S. Department of Defense and was one of the principle authors of the NSSO report on space-based solar power. “'Space-based solar power could solve energy crisis” http://articles.timesofindia.indiatimes.com/2009-07-10/interviews/28182324\_1\_solar-power-solar-energy-recoverable-conventional-oil-reserves. Jul 10, 2009) AP

What is space-based solar power all about? Though solar energy is one of the most popular renewable energy sources, the cost of tapping the same has always been comparatively more because of its diluted form, seasonal variations and non-availability for more than half of the day. SBSP overcomes these issues by placing the solar collector panels in a geo-synchronous orbit in space and have the solar power beamed to earth before converting it to useful electricity. Solar energy could be beamed to earth as radio waves or coherent light (LASER).Just to understand the enormity of energy availability, a kilometre-wide band at a geo-orbit experiences enough solar flux in one year to nearly equal the amount of energy contained within all known recoverable conventional oil reserves on earth today. And it is 99 per cent uninterrupted through the year. How about commercial viability? Commercial viability is a big unknown, and will be so until power starts being delivered. There are many ideas and proposals in many places around the world, but no working prototype has ever been built and flown on orbit. Many believe there is a need for additional technical development and risk-reduction. Clearly, there are some companies who are already quite confident about its commercial viability, as witnessed by the deal finalised a few weeks ago in California. The California Power Utility has agreed to buy 200 MW of electricity from Pacific Gas & Electric Company from 2016, which would be generated from a space-based solar station. How does SBSP compare with other conventional energy sources in terms of fighting greenhouse gas emissions? Space solar life cycle CO2 is 60 times better than a conventional coal-fired power plant. It's by far one of the cleanest energy forms available. Space-based solar power is so promising that it could well be the answer to the world's energy crisis. How could India contribute to this programme? Former president A P J Abdul Kalam has suggested that SBSP be made a national and international goal. The Aerospace Society of India (AeSI) has called for a global aerospace and energy mission, and articulated the need for a directed academic, industry and government study, as well as consideration of a leadership role in an International Thermonuclear Experimental Reactor-like experiment. Some people i have talked with have mentioned putting it on the Indo-US strategic agenda as part of the renewable energy and space partnerships.

### SBSP can quickly replace oil and ensures global energy

Bloom ’07 (James, Staff Writer for the Guardian. “Power from the final frontier” http://www.guardian.co.uk/technology/2007/nov/01/guardianweeklytechnologysection.research. 1 November 2007) AP

At some point before 2050, satellites collecting solar power and beaming it back to Earth will become a primary energy source, streaming terawatts of electricity continuously from space. That's if you believe a recent report from the Pentagon's National Security Space Office, which says confidently that we will see "a basic proof-of-concept within 4-6 years and a substantial power demonstration as early as 2017-2020". It's obvious in some ways: above the atmosphere, a solar cell receives about 40 times more energy per year than an equivalent site on the ground, due to the absence of atmospheric scattering and seasonal or nightly reductions in light. The NSSO suggests that an orbiting spacecraft with solar panel arrays would be comparable to current ground-based installations spanning hectares and, eventually, a few square kilometres. Then that energy can be sent to the ground - using, the Pentagon suggests, a giant laser or microwave beam. The report, Space Based Solar Power as an Opportunity for Strategic Security, suggests optimistically that one application will be the beaming of "energy aid" via satellite into conflict and disaster zones, minimising the human cost of resource wars and catastrophic events caused by global warming. "The technology has been in development for a while," says Joseph Rouge, associate director of the space office. "The truly hard and expensive part is going to be getting it into orbit. We'll need regular launches and on-orbit robotic assembly systems. It's a $10bn [£4.8bn] programme, but by 2050 it could deliver 10% of America's power needs." The space office sees energy supply as one of strategic importance as oil supplies dwindle; according to a report by Germany's Energy Watch Group published last week, "peak oil" output occurred last year, and will fall by 7% annually to half its present levels by 2030. The space office notes that all remaining oil resources are estimated to contain 250 terawatt-years of energy; but that a one-kilometre wide band in geosynchronous orbit receives about 212 TW-years of energy each year.

## Solves quickly/Now is key

### SBSP can quickly solve energy needs.

NSS ’07 (National Space Society, “Report to the Director, National Security Space Office Interim Assessment” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf. October 10, 2007)

This study revealed that while the business case for SBSP cannot be closed for construction to begin in 2007, the technical feasibility of the concept has never been better and all science and technology development vectors appear to indicate that there is credible potential for SBSP to be built within a strategically relevant period of time. This review also uncovered surprisingly significant interest and evaluation within academia, the aerospace industry, and energy industries that is progressing independently of DoD reviews. The United States is not the only country to observe the potential of SBSP and the improving technical state‐of‐the‐art, as substantial interest and support have been witnessed in other regions of the world to include Europe, Japan, Canada, India, China, and Russia among others. This international interest can be leveraged to build or strengthen strategically stabilizing long‐term partnerships.

### Now is key- US must reduce dependence to protect itself from economic and political threats Cohen 6 (Ariel, Ph.D. from Tufts University Senior Research Fellow for International Energy Policy at the Heritage Foundation, “Reducing U.S. Dependence on Middle Eastern Oil”, 4-7-06, http://www.heritage.org/research/reports/2006/04/reducing-us-dependence-on-middle-eastern-oil) OP

The unfortunate reality is that the Middle East remains the strategic center of gravity of the global oil market-a position that is not likely to change in the medium term. As long as radical Islam, China, India, and Europe continue the struggle for the world's limited oil supply in the Middle East, the region will remain unstable. If the U.S. is to protect itself from these economic and political threats, it must reduce its dependence on Middle Eastern oil as quickly and efficiently as possible.

### Now is key- only a mater of time until America's energy security, economic health, and defense capabilities will be jeopardized by the growing political instability, terrorism, and potential warfare of the Middle East Cohen 6 (Ariel, Ph.D. from Tufts University Senior Research Fellow for International Energy Policy at the Heritage Foundation, “Reducing U.S. Dependence on Middle Eastern Oil”, 4-7-06, http://www.heritage.org/research/reports/2006/04/reducing-us-dependence-on-middle-eastern-oil) OP

It is only a matter of time until America's energy security, including its economic health and defense capabilities, will be jeopardized by the growing political instability, terrorism, and potential warfare in the Middle East. Over time, the U.S. needs to limit its dependence on foreign oil, especially from the Middle East, shifting to other sources of supply and eventually to new types of energy sources. Limiting U.S. dependence on Middle Eastern oil will be a major strategic challenge for the U.S. in the coming decades.

## \*\*\*Peak Oil/Inherency\*\*\*

## Dependence Increasing

### Ext- oil dependence increasing

Newsweek 11 (“Egypt and the Gas Pump”, 2-6-11, http://www.newsweek.com/2011/02/06/egypt-and-the-gas-pump.html) OP

Oil isn’t going quietly into the night. We need to contain our addiction, even if we can’t end it. A recent ExxonMobil study projects that the number of light-duty vehicles worldwide will grow 50 percent to 1.2 billion by 2030, with two fifths of the increase in China. Most will use gasoline. Competition for global oil supplies will intensify. We cannot escape that reality, even if we ignore it.

### Now key – globalization means consumption’s spinning out of control

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

Since the “Fresh Look” Study much has changed. The events of 9/11 dramatically altered the world strategic security environment. Major energy producing areas of the world are perceived as being unstable, and the risks of dependence on unstable areas of the world for energy supplies are increasingly less acceptable to both citizens and policymakers. The rising demand of the developing world—in particular the burgeoning economies of China and India—are increasing energy competition. Growing concern over long‐term climate change has become a mainstream issue. Globalization, begun at the end of the last century has created an extremely rapid and accelerating pace of change in the technological, informational, and business sectors. These changes are being driven by the aggregate decisions of billions of people, millions of companies, thousands of governments, and huge international markets that cross the borders of over a hundred countries. The ability to stop, or even slow, this change is beyond the ability of any single nation, company, or organization. The DoD, as the nation’s largest institutional consumer of technology and energy, has determined that long‐term energy security is now a forefront issue. The early developments of the 21st Century have created conditions that merit that this nation takes a relook of SBSP.

## High Prices/Shocks Inevitable

### Oil pipelines vulnerable to terrorist attack – attacks cause huge price spikes and supply shocks

Wald et al 9 (General Charles F Wald, Former Deputy Commander, Headquarters U.S. European Command, General Gordon R. Sullivan, Former Chief of Staff, U.S. Army, and Former Chairman of the CNA MAB, Vice Admiral Richard H. Truly, Former NASA Administrator, Shuttle Astronaut and the ﬁrst Commander of the Naval Space Command, “Powering America’s Defense,” May 2009. <http://www.cna.org/sites/default/files/Powering%20Americas%20Defense.pdf>)

The MEND is but one example of a group operating in an unstable region that targets oil and its infrastructure for its strategic, political, military, and economic consequences. By 2007 in Iraq, in comparison to pre-2003 levels, effects from the war and constant harassment of the oil infrastructure by insurgent groups and criminal smuggling elements reduced oil production capacity in the northern ﬁelds by an estimated 700,000 barrels per day [31]. In 2006, al Qaeda in the Arab Peninsula carried out a suicide bombing against the Abqaiq oil production facility in Saudi Arabia, which handles about two-thirds of the country’s oil production [32]. Fortunately, due largely to the intense focus of the Saudis on hardening their processing facilities (to which they devote billions of dollars each year), the attack was suppressed before the bombers could penetrate the second level of security gates. However, both the Saudi level of protection and al Qaeda’s selection of the oil infrastructure as a target signify the strategic and economic value of such facilities. The effects of these attacks have been regional, and none resulted in a catastrophic disruption in the ﬂow of oil. However, these attacks have demonstrated the vulnerability of oil infrastructure to attack; a series of well-coordinated attacks on oil production and distribution facilities could have serious negative consequences on the global economy. Even these small-scale and mostly unsuccessful attacks have sent price surges through the world oil market.

### High oil prices and supply shocks are inevitable – only a risk plan solves

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

Energy Concerns, Prices and Costs Oil prices have increased from less than $15US per barrel during 1999 to over $80 US per barrel today (2007). The higher oil prices go, the more viable becomes the business case for Scenario 2 ‐ SBSP as an alternative source of energy. Price though is not the only concern. The stability and security of the flow of oil into the United States is also very important. While Canada is America’s largest supplier, much of the rest of her imported oil comes from the unstable regions of the Middle East or unstable countries such as Nigeria or unfriendly ones such as Venezuela. Energy security and continued supply are serious concerns. Oil supplies may not run out in our lifetimes but we must plan for future generations. Supplies are being consumed at a higher rate than new reserves are being discovered. Demand has dramatically increased from emerging countries such as China and India, along with the slow steady increases from Western economies. Decreasing supply or increasing demand can each lead to higher prices. With both forces acting together, higher prices are expected to continue and accelerate. Coal and natural gas, which are primarily used for the generation of electricity, have also seen price increases in recent years though not to the degree that oil has increased. Since the source of these is primarily domestic, it is not subject to the same uncertainty premium that oil currently carries. Coal‐based electricity, using current emission controls, provides electricity at about 5 cents per kWh (busbar cost). The primary challenge to this is global warming, which may force new plants (and retrofits at existing plants) to capture CO2 for sequestration. Carbon capture and sequestration technologies and systems are expected to add at least a few cents per kWh.

## Peak Oil = true

### Peak oil true- we’ve already seen the indicators- high prices and declining production

Deffeyes 08 (Kenneth S., a geologist and Emeritus Professor at Princeton University, “Hubbert's peak: the impending world oil shortage”, ix-x, Google Books) OP

Welcome lo the world beyond Hubbert's peak. On page 158 of the book in your hand, I made the prediction that world oil production would peak in the year 2005. What happened next? In 2005, oil production stopped growing, and the price of crude oil shot upward from $45 per barrel to $ 140 per barrel. We hit "peak oil"—also called "Hubbert's peak"—a geological limitation to the oil supply in the ground. With no additional supplies, a bidding war began in 2005 over the remaining oil in the ground. The urge to say, "I told you so," is too much to resist. Not only are the decline in oil production and subsequent rise of oil prices going to happen, as 1 maintained in this book, but for all practical purposes, they already have happened. The consequences of high oil prices are now rippling through the economy. Food prices are up sharply because modern agriculture is an energy-intensive business and because agricultural capacity is being shunted into biofuel production. Many automobile manufacturers are suffering because their profitable SUVs and light trucks are not selling. By my count, at least seven passenger airlines have departed to that great airport in the sky. And, after paying for gasoline and food, many consumers don't have enough money left over to make their mortgage payments. We all learned in Econ 101 that an increase in price will generate an increase in supply. This is simply the law of supply and demand at work. And, as economists predicted, an increase in supply did happen. Since 2005, the price of oil has tripled, and world crude oil production has increased by a factor of 1.005- Obviously, the effect of the price increase was nowhere near as strong as expected. What is going on when prices triple and there is only a tiny increase in production? 1 interpret it as a bidding war. When geologic constraints stopped the growth of crude oil production, consumers around the world began outbidding one another for the remaining oil supply.

### Peak oil theory true- accepted by geologists

Verbruggen 10 (Aviel, Professor at the University of. Antwerp (Blegium) in Environmental and Energy Technology and Economics, “Views on peak oil and its relation to climate change policy”, October, http://www.sciencedirect.com/science/article/pii/S0301421510003514#implicit0) OP

Peak oil is developed and supported most by geologists, e.g. Hubbert (1956), Campbell (1994, 2006), Campbell and Laherrere (1998), Bentley (2002) and Hirsch (2007). Oil deposits are nonrenewable and ﬁxed, making stocks decrease with consumption. Simmons (2008) derives his pessimistic view from analyzing ﬁnancial ﬂows in the oil exploration and exploitation business. Peak oil authors argue that many estimates of oil reserves and resources are non-reliable and overestimated. Estimates are generated by producing countries themselves. Some countries may manipulate estimates for own gain, in particular OPEC countries declaring upward-biased reserves because OPEC assigns production quota along the size of its members’ oil reserves. Suspect reserves stay constant year after year (i.e. new discoveries exactly match production) or increase suddenly by large numbers (Campbell, 1994). Another argument is the decreasing discovery rate. The largest ﬁelds are found ﬁrst because they are ‘too big to miss’. The large ﬁelds are aging and fewer are discovered, while production mirrors discovery with a time-lag. Campbell (2006) states that in 1981 the world started to consume more oil than it found and that the gap between discovery and production is widening. Based on historical discoveries and stochastic simulation of future discoveries, Shell ﬁnds a normal distribution for new discoveries of regular conventional oil when smoothed for a 20-year moving average (Tsoskounoglou et al., 2008: p. 3800). The year 2005 knew the lowest oil discovery level ever and in 2008, the world consumed 2–3 barrels (Tsoskounoglou et al., 2008: p. 3800) or even 4–5 barrels (Hall et al., 2008: p. 113) for every new discovered oil barrel. Peak oil authors state that the largest and most accessible sedimentary areas have already been explored extensively. Therefore, future discoveries will likely occur in smaller quantities and in more remote areas, and production will be more difﬁcult and costly. The rate of worldwide oil discovery has been decreasing and some areas have failed to yield any recoverable oil while once thought to possess signiﬁcant oil potential (Craig et al., 2001: pp. 168–169).

### Prefer our scientific evidence to their economists- they only consider the economic aspect Verbruggen 10 (Aviel, Professor at the University of. Antwerp (Blegium) in Environmental and Energy Technology and Economics, “Views on peak oil and its relation to climate change policy”, October, http://www.sciencedirect.com/science/article/pii/S0301421510003514#implicit0) OP

Critical visions on peak oil are stated mostly by economists. They consider reserves predominantly an economic concept, e.g. Adelman (1990, 1993), Odell (1992), Lynch (1999), Watkins (2006) and Maugeri (2004, 2006). ‘‘Oil reserves are the amount of oil that is minable at today’s prices using existing technology’’. The economist vision rather ignores critical geological features of oil stocks (Hallock et al., 2004). Reserves and resources are no ﬁxed numbers but constitute a dynamic ﬂux depending on prices and technology.

### Peak Oil theory is true Hall et al 8 (Charles A.S., ESF Foundation Distinguished Professor at State University of New York in the College of Environmental Science & Forestry, “Peak Oil, EROI, Investments and the Economy in an Uncertain Future”, http://www.springerlink.com/content/q31418v301002426/) OP

Peak oil, that is the time at which an oil field, a nation or the entire world reaches its maximum oil production and then declines, is not some abstract issue debated by theoretical scientists or worried citizens but an actuality that occurred in the United States in 1970 and in some 60 (of 80) other oil-producing nations since (Hubbert 1974, Strahan 2007, Energyfiles 2007). Sev- eral prominent geologists have suggested that it may have occurred already for the world, although that is not clear yet (e.g. Deffeyes 2005, see EIA 2007, IEA 2007). With global demand showing no sign of abating at some time it will not be possi- ble to continue to increase petroleum supplies, especially oil globally and natural gas in North America, or even to maintain current levels of supply, regardless of technology or price. At this point we will enter the second half of the age of oil (Campbell 2005). The first half was one of year by year growth, the second half will be of continued importance but year by year decline in supply, with possibly an “undulating plateau” at the top and some help from still-abundant natural gas outside North America separating the two halves and buffering the impact somewhat for a decade or so. We are of the opinion that it will not be possible to fill in the growing gap between supply and demand of conventional oil with e.g. liquid biomass alter- natives on the scale required (Hall et al. in review), and even were that possible that the investments and time required to do so would mean that we needed to get started some decades ago (Hirsch et al. 2005). When the decline in global oil production begins we will see the “end of cheap oil” and a very different economic climate.

### Peak oil by 2015- government denial now clarified

Hodge ’11 (Nick, Editor for Energy and Capital. “2015: End of the Oil Age”. http://www.energyandcapital.com/articles/2015-end-of-the-oil-age/1609. July 1st, 2011) AP

If you're insolent enough to seek the truth, you might just come out ahead in this mess. For years, global governments have built up a wall of deceit to shelter the public from the reality of the end of oil. And for years, scientists and institutions not beholden to shareholders or constituents have tried to sound the alarm with muted results. But several events in the past few months have proven the most powerful governments in the world have known about Peak Oil for years. They've been intentionally downplaying it. And they have no idea what to do about it... It's not alarmist to say or think the world is running out of oil. It's actually one of the most prudent things I can think of. Behind the Lies As recently as 2009, the United Kingdom's official position was that “global oil (and gas) reserves are sufficient to sustain economic growth for the foreseeable future”; also that existing policies put it “in a good position to deal with the longer-term challenge of declining oil reserves.” The government consistently cited the International Energy Agency's forecast that Peak Oil wouldn't occur until 2030, if at all. Now, after being repeatedly threatened under the Freedom of Information Act, the release of a years-old report shows the UK government has known about imminent Peak Oil and its consequences. We now know the Labour Government spent six months evaluating the likely impacts of Peak Oil back in 2007. (You can see that research in a PowerPoint recently released by the government.) As a result of that research, the government was warned of “significant negative economic consequences”, should Peak Oil occur in the short term. The report also noted it was impossible to forecast the exact moment when supply would peak — but there would be global consequences, including “civil unrest”, when it did. In a worst-case scenario, the peak would happen before 2015. The report's conclusion stated it is “clear” that: Existing fields are maturing; The rate of investment in new and existing production is being slowed down by bottlenecks, the economic downturn, and financial crisis; and Alternative technologies to oil will take a long time to develop and deploy at scale. Again, the UK government has had this report for years and has been denying its conclusions the entire time. Coming to Jesus Remember, UK officials were only echoing the International Energy Agency in saying Peak Oil could never happen before 2030. That would be fine — except for the fact the IEA changed its stance in late 2008. After conducting the first comprehensive study of the annual decline in output from the world's 800 largest oil fields, the IEA mentioned the word “peak” for the first time in its World Energy Outlook. It also raised the annual decline rate from 3.7% to 6.7% — almost double the previous rate at which it said oil fields were depleting. After that report was published, IEA Chief Economist Fatih Birol had this to say: In terms of non-OPEC, we are expecting that in three, four years' time the production of conventional oil will come to a plateau, and start to decline... In terms of the global picture, assuming that OPEC will invest in a timely manner, global conventional oil can still continue, but we still expect that it will come around 2020 to a plateau as well... I think time is not on our side here. He must've been lying then, too — or at least severely distorting the truth. Because ol' Fatih dropped another bombshell two months ago during a television interview: When we look at the oil markets the news is not very bright. We think that the crude oil production has already peaked in 2006. The existing fields are declining sharply in North sea, in United States, in Gulf of Mexico. Just to stay where we are today we have to find four new Saudi Arabia's, this is a tall order. (transcript here) Yep. In late April, the head of the IEA said crude oil production peaked five years ago. No big deal — not newsworthy or anything. He said it on a Thursday and we killed bin Laden two days later, so the clip conveniently didn't make it into the news cycle... But you know it now. And you can use this truth for personal gain while the herd continues to obliviously graze. Spreading the Word So the IEA and the UK government are now out of the closet when it comes to Peak Oil. Anyone else want to step up and admit Peak Oil is real, and will happen sooner rather than later? I promise, the punishment will be less harsh if you confess now. There are a few brave souls... The UK Industry Taskforce on Peak Oil and Energy Security — composed of Yahoo!, Virgin, and others — warned in a report last year that serious oil shortages could occur by 2015. The U.S. military has warned surplus oil capacity could disappear within two years with serious shortages by 2015. Sweden (and Uppsala University physics professor Kjell Aleklett, in particular) still isn't satisfied with the IEA's partial admission of the peak. The Swedish Energy Agency funded its own Peak Oil research. After what he found, Aleklett calls the IEA's World Energy Outlook a “political document” meant only to aid geopolitics for oil-consuming countries with a vested interest in low prices. (He meant the United States, if you didn't discern that bit on your own.) According to Aleklett and his team, oil output in 2030 is likely to be closer to 75 million barrels per day instead of the IEA's more optimistic forecast of 105 mbd. Organized societies would be reduced to chaos if that happened, which is exactly why governments have been denying it so long. After calling the IEA's forecast and methodology “dubious”, Aleklett added: “I am a scientist, not an economist or a politician. I believe in the facts and if someone can prove me wrong I will happily change my mind.” The conclusion of the Peak Oil report being covered up in the UK offered this: While alternative technologies could be pulled through by the combination of economics and government policies, the lead-times for any real impact on oil demand are long. Globally, in response to a peak, some countries may adopt short-term, partial solutions such as more coal consumption and high carbon oil production that could result in an increase in global emissions. Coal will be burned in developing nations like India and China as a cheap way to fuel growth. And richer nations will spend increasing amounts of cash on extracting every last bit of oil and gas. That means fracking. That means tar sands. That means deepwater. You're seeing this happen already. Remember what Mr. Birol said: We need to find four new Saudi Arabias merely to remain at today's output levels. As the peak plays out, any remaining oil is going to be valued much higher than today's $95. And while I don't know where four new Saudi Arabias are going to come from, I have seen a report that we'll find at least one. It's actually an extension of the same formation that gave the Saudis their copious amounts of crude, though the deposit is well outside their borders... At over 70 billion barrels, this newly-found oil is open to any company who gets there and sets up shop. And according to everything I read, this could be the largest deposit of easy oil left in the world. Call it like you see it,

**Oil production flat since 04- peak oil approaching quickly**

### Reynolds 10 (Lewis, energy consultant and author of “America the Prisoner: The Implications of Foreign Oil Addiction and a Realistic Plan to End It”, “Seven Dangerous Side Effects of the U.S. Dependency on Foreign Oil”, 8-8-10, http://peakoil.com/production/seven-dangerous-side-effects-of-the-u-s-dependency-on-foreign-oil/) OP

Our fate has long been tied to the oil issue. But now we’re near the threshold at which our addiction will completely break us. We are quickly approaching what is called “peak oil”—the point at which world oil production will reach its maximum point and then begin to decline because of supply limitations. Even the most optimistic projections of peak oil place it around the year 2023. Some would argue that peak oil has already been reached, and world production statistics are certainly not at odds with that conclusion. World oil production has been essentially flat since 2004. Only the temporary abatement of pressure on demand growth caused by the global recession has kept prices from skyrocketing. With no viable alternative in place, decreasing supply and increasing prices will culminate in a predicament where we the people still need oil to go about the business of daily life—but can no longer afford it.

### Now is key- resources will be depleted Alternative Heating 11 (“The Consequences of Oil Stocks Depletion”, 1-27-11, http://www.alternative-heating.com/oil-stocks.html) OP

Any way you look at it, the depletion of oil stocks has permanent negative effects on society as a whole worldwide. The United States is the number one consumer of oil in the world, with China following closely behind, and already we are starting to see the lasting effects of dependence upon oil production and oil stocks. Prices of oil products like heating oil are shooting through the roof, especially gas. However, the United States is not the only country at fault for the rising value and falling supply of oil. Global growth has led to a peak usage of oil throughout the world. Unless something is done soon to replace oil as a major source of energy, this resource will be depleted, and pocketbooks will begin to feel the pain as the situation worsens.

## \*\*\*Economy\*\*\*

## Oil Dependence kills the Economy

### Oil dependence hampers economy – kills growth

Rampell, Rich, and Streitfeld ’11 (Catherine, Mokoto, and David. Staff Reporters for the New York Times. “Rising Oil Prices Pose New Threat to U.S. Economy” http://www.nytimes.com/2011/02/25/business/economy/25econ.html?\_r=1&pagewanted=print. February 24, 2011)

The American economy just can’t catch a break. Last year, as things started looking up, the European debt crisis flustered the fragile recovery. Now, under similar economic circumstances, comes the turmoil in the Middle East. Energy prices have surged in recent days, as a result of the political violence in Libya that has disrupted oil production there. Prices are also climbing because of fears the unrest may continue to spread to other oil-producing countries. If the recent rise in oil prices sticks, it will most likely slow a growth rate that is already too sluggish to produce many jobs in this country. Some economists are predicting that oil prices, just above $97 a barrel on Thursday, could be sustained well above $100 a barrel, a benchmark. Even if energy costs don’t rise higher, lingering uncertainty over the stability of the Middle East could drag down growth, not just in the United States but around the world. “We’ve gone beyond responding to the sort of brutal Technicolor of the crisis in Libya,” said Daniel H. Yergin, the oil historian and chairman of IHS Cambridge Energy Research Associates. “There’s also a strong element of fear of what’s next, and what’s next after next.” Before the outbreak of violence in Libya, the Federal Reserve had raised its forecast for United States growth in 2011, and a stronger stock market had helped consumers be more confident about the future and more willing to spend. But other sources of economic uncertainty besides oil prices have come into sharper focus in recent days. After a few false starts, housing prices have slid further. New-home sales dropped sharply in January, as did sales of big-ticket items like appliances, the government reported Thursday. Though the initial panic from last year has faded, Europe’s deep debt problems remain, creating another wild card for the global economy. Protests turned violent in Greece this week in response to new austerity measures. Budget and debt problems at all levels of American government also threaten to crimp the domestic recovery. Struggling state and local governments may dismiss more workers this year as many face their deepest shortfalls since the economic downturn began, and a Congressional stalemate over the country’s budget could even lead to a federal government shutdown. “The irony is that we just barely got ourselves up and off the ground from the devastating financial crisis,” said Bernard Baumohl, chief global economist at the Economic Outlook Group, who had been optimistic about the country’s prospects. “The recovery itself is less than two years in, and we haven’t yet seen jobs make a decent comeback. Now we’re being hit with this new, very ominous event, so the timing couldn’t be worse.” Most economists are not yet talking about the United States dipping back into recession, and it is too soon to tell how far the pro-democracy protests that have roiled Egypt, Bahrain and Libya will spread. For now, most analysts are not predicting that Iran and Saudi Arabia, repressive governments that also happen to be two of the world’s biggest oil producers, will catch the revolutionary fever. “But revolutions are notoriously difficult to forecast,” said Chris Lafakas, an economist at Moody’s Analytics who focuses on energy. Disruptions of oil supplies in Saudi Arabia and Iran in particular, he said, “would be catastrophic for prices. Saudi Arabia alone could cause maybe a 20 to 25 percent increase in oil prices overnight.” In the last week, oil prices have risen more than 10 percent and even breached $100 a barrel. A sustained $10 increase in oil prices would shave about two-tenths of a percentage point off economic growth, according to Dean Maki, chief United States economist at Barclays Capital. The Federal Reserve had forecast last week that the United States economy would grow by 3.4 to 3.9 percent in 2011, up from 2.9 percent last year. Higher oil prices restrain growth because they translate to higher fuel prices for consumers and businesses. Mr. Lafakas estimates that oil prices are on track to average $90 a barrel in 2011, from $80 in 2010, an increase that would offset nearly a quarter of the $120 billion payroll tax cut that Congress had intended to stimulate the economy this year. Rising gasoline prices have already led Jayme Webb, an office manager at a recycling center in Sioux City, Iowa, and her husband, Ken, who works at Wal-Mart, to cut back on spending. In the last month, they have canceled their satellite television subscription and their Internet service. They have also stopped driving from their home in rural Moville to Sioux City on weekends to see Ms. Webb’s parents. Along with making their commutes to work more expensive, rising oil prices have driven up the cost of food for animals and people. So the couple have stopped buying feed for their dozen sheep and goats and six chickens and instead asked neighboring farmers to let them use scraps from their corn fields. “It’s a struggle,” said Ms. Webb, 49. “We have to watch every little penny.” A cutback in consumer spending reverberates through the economy by crimping businesses, making it less likely that employers will commit to the additional hiring needed to lower the 9 percent unemployment rate. “Revenue is down, costs are up, and you can’t make any money,” said R. Jerol Kivett, the owner of Kivett’s Inc., a company that manufactures pews and other church furniture in Clinton, N.C. “You’re just trying to meet payroll and keep people working, hoping the economy will turn. But it just seems like setback after setback after setback.” And the money that consumers and businesses spend on oil often does not stay within the American economy. Nor do the expanded coffers in oil-producing countries raise demand for American exports, because they often bank it as reserves. “The countries that are getting this bonus basically get an enormous benefit,” said Raghuram G. Rajan, an economics professor at the University of Chicago. “But if they can’t spend it quickly, it doesn’t add to aggregate demand.” The rise in oil prices could also create a vicious cycle, as higher energy costs propel already rising food prices, which in turn can lead to more political unrest and more global uncertainty. Even without the Middle East, the domestic economy has a number of weaknesses that have proved hard to overcome. The recession was provoked by housing and worsened by housing, and housing is likely to remain frail in parts of the country until the end of the decade. After a couple of brief growth spurts, home prices have started declining again in earnest. This week, the Yale economist Robert Shiller speculated about another drop as large as 25 percent. Anything close to that would push millions more households to the point where they owe more on their houses than the houses are worth, generating a lot of sour moods — which can depress consumer spending — more foreclosures and potential job losses. Even absent such a decline, lenders remain cautious, punishing those who never indulged during the boom. Maria Schneider and Roger Westerman have plenty of equity in their Brooklyn home, and a 17-year record of paying on time. Last fall, the couple tried to capitalize on historically low mortgage rates and refinance. They estimated they would save $360 a month. But their lender said they were a bad credit risk. The couple, both 48, are self-employed. “We could be sending all three of our kids to camp this summer instead of just one,” Mrs. Schneider said. There are some signs that the economy could weather this latest round of buffeting. Revenue at many companies is back to prerecession levels, said Scott Bohannon, a general manager at the Corporate Executive Board, a research and advisory firm. That suggests companies may start adding equipment, factories and, eventually, workers. “Of course, if a war breaks out in a significant way or something like that happens,” he said, “then I would give you a different answer. Then you’re talking about huge shocks to the system.”

### Oil dependency weakens US economy Reynolds 10 (Lewis, energy consultant and author of “America the Prisoner: The Implications of Foreign Oil Addiction and a Realistic Plan to End It”, “Seven Dangerous Side Effects of the U.S. Dependency on Foreign Oil”, 8-8-10, http://peakoil.com/production/seven-dangerous-side-effects-of-the-u-s-dependency-on-foreign-oil/) OP

It causes ongoing damage to the American economy (and weakens our power in the world). Oil dependence is slowly eating away at the true source of American power (our economy) as each year the U.S. exports more and more of its wealth in exchange for oil. U.S. trade deficits have created a situation that forces reliance on overseas capital to support the economy. Much of that capital comes from the petroleum exporting countries that, in turn, get it from oil consumption by American businesses and consumers. Today the American economy is based less on producing either goods or services and more on consumption. This drives what is known as the “petrodollar” system. It begins with the purchase of oil by the U.S. consumer, which sends massive dollar-denominated cash flows to oil exporting countries. In addition, U.S. consumers buy imported goods resulting in flows of dollars to those countries. In turn, the manufacturing nations must purchase oil, which they accomplish with the dollars they obtained from selling products in the U.S. market. At this point, the oil exporters are awash in dollars, which they must either spend or invest.

### Oil dependence damages economy- inevitable squo energy drop breaks the financial system

Heinberg ’05 (Richard Heinberg, American journalist and educator who has written extensively on ecological issues, including oil depletion. He is the author of at least ten books. “The Party’s Over - Oil, War, and the fate of Industrial societies”. June 1, 2005) AP

The lower-energy economy of the future will be characterized by lowered productivity. There could be a good side to this in that more human labor will be required in order to do the same amount of work, with human muscle-power partially replacing the power of fossil fuels. Theoretically, this could translate into near-zero unemployment rates. However, the financial system may not respond rationally. With less physical economic activity occurring, businesses would be motivated to take out fewer loans. This might predictably trigger a financial crisis, which would in turn likely undermine any attempts at a smooth economic adjustment. As Hubbert pointed out, the linkage between the money system (the financial economy) and the human matter-energy system (the physical economy) is imperfect. It is possible for a crisis to occur in the financial system even when energy, raw materials, and labor remain abundant, as happened in the 1930s. But is it also possible for the financial system to remain healthy through an energy-led decline in the physical economy? That, unfortunately, is highly unlikely, due to the dependence of the former on continued borrowing to finance activity in the latter. Rather, it is highly likely that the net-energy decline will sooner or later trigger a financial crisis through a reduction in demand for goods and services, and hence for money (via loans) with which to pay for the machinery to produce those goods and services. Thus even if human labor is sufficiently abundant to make up for some of the reduction of work performed by fuel-burning machines, the financial system may not be able to adapt quickly enough to provide employment for potential laborers. Therefore extreme dislocations in both the financial system and the human matter-energy economy are likely during the energy transition. The exact form these dislocations will take is difficult to foresee. Efforts could be made to artificially pump up the financial system through government borrowing — perhaps to finance military adventures. Such massive, inflationary borrowing might flood markets with money that would be losing its value so quickly as to become nearly worthless. On the other hand, if inflationary efforts arc not undertaken quickly or strenuously enough when needed, then the flagging rate of loans might cause money to disappear from the economy; in that case, catastrophic deflation would result. As was true in the Great Depression, what little money was available would have high purchasing power, but there would simply be too little of it to go around. Unemployment, resource and product shortages, bankruptcies, bank failures, and mortgage foreclosures would proliferate. It is entirely possible that, over a period of decades, both inflationary and deflationary episodes may occur; however, due to the lack of a stable linkage between money and energy, periods of financial stability will likely be rare and brief. Continued population growth, even at reduced rates, will put added strain on support systems and exacerbate the existing inherent requirement for economic growth. Who will feel the pain? Most likely, the poor will feel it first and hardest. This will probably be true both nationally and internationally, as rich nations will likely seek to obtain energy resources from the poorer nations that have them by financial chicanery or outright military seizure. Eventually, however, everyone will be affected. Some comforts, even luxuries, will probably continue to be available in most countries; but regardless of whether the financial environment is inflationary or deflationary, nearly everything that is genuinely useful will become relatively more expensive because the energy employed in its extraction or production will have grown more rare and valuable.

### Oil dependency causes dollar decline- collapses economy Reynolds 10 (Lewis, energy consultant and author of “America the Prisoner: The Implications of Foreign Oil Addiction and a Realistic Plan to End It”, “Seven Dangerous Side Effects of the U.S. Dependency on Foreign Oil”, 8-8-10, http://peakoil.com/production/seven-dangerous-side-effects-of-the-u-s-dependency-on-foreign-oil/) OP

It’s leading to the decline of the dollar. Although, in previous decades, the Federal Reserve has viewed energy prices as a component of inflation and reacted to increasing oil prices using anti-inflationary measures, the modern Federal Reserve has feared that increasing oil prices are more likely to precipitate a recession. The Fed has responded to price shocks by increasing the money supply in hopes of stimulating aggregate demand. The long-term trend of the dollar is downward, which places upward pressure on oil prices. The Fed has responded to increasing oil prices by printing more money. Increasing the money supply makes a given dollar worth less, which means that more dollars are needed to buy a given quantity of oil. The falling dollar and the increasing price of oil have elicited policies from the Fed that cause the dollar to fall still further and the price of oil to increase even more, accelerating and intensifying the effects. The increasingly unstable fiscal situation in the U.S. is not only a concern for Americans, it is also alarming to foreign holders of dollar-denominated assets. Oil exporting nations continue to accumulate dollars, but they also recognize that the lack of fiscal sanity in Washington will eventually erode the dollar’s value and, with it, their investment portfolios. Our fate is in their hands. If they begin selling oil in other currencies or divest their dollar-denominated assets, the dollar will go into free-fall, and the fallout in the U.S. economy could be far-reaching. It is vital to U.S. economic security to ensure that a breakdown in the petrodollar system, which may well be inevitable, does not precipitate an absolute economic collapse.

### Continued oil dependence will lead to another Great Depression Schoen 4 (John W., senior producer at MSNBC, “How long will the world's oil last?, 6-25-04, http://www.msnbc.msn.com/id/5945678/ns/business-oil\_and\_energy/t/how-long-will-worlds-oil-last/) OP

No one is suggesting that the world oil industry is close to pumping its last drop. But the question now being raised is whether new reserves can be discovered fast enough to both replace depleted oil fields and keep up with growing demand. Some argue that the world is rapdily approaching the point where the pace of oil depletion overtakes the growth in new supplies. “The worry is whether there is something worse than the Great Depression of the 1930s waiting for us — particularly that the United States gets heavily hurt because we burn a quarter of the world’s oil,” said Princeton University geologist Kenneth Deffeyes.

### Oil shocks would collapse US economy-empirically proven Hall et al 8 (Charles A.S., ESF Foundation Distinguished Professor at State University of New York in the College of Environmental Science & Forestry, “Peak Oil, EROI, Investments and the Economy in an Uncertain Future”, http://www.springerlink.com/content/q31418v301002426/) OP

What would be the impacts of a large increase in the energy and dollar cost of getting our petroleum, or of any restriction in its availability? While it is extremely difficult to make any hard predictions, we do have the record of the impacts of the large oil price increases of the 1970s as a possible guide. These “oil shocks” had very serious impacts on our economy which we have examined empirically in past publications (e.g. Hall et al. 1986). Many economists then and now did not think that even large increases in the price of energy would affect the economy dramatically because energy costs were but three to six percent of GDP. But by 1980, following the two “oil price shocks” of the 1970s, energy costs had increased dramatically until they were 14 percent of GDP. Actual shortages would have even greater impacts, if for example sufficient petroleum to run our industries or busi- nesses were not available at any price. Other impacts included, and would include, an enhancement of our trade imbalances as more income is diverted overseas, adding to the foreign holdings of our debt and a decrease in discretionary disposable in- come as more money is diverted to access energy, whether via higher prices, more petroleum exploration or low EROI alternative fuels. This in turn would affect those sectors of the economy that are not essential. Consumer discretionary spending would probably fall dramatically, greatly effecting non-essential businesses such as tourism.

### 57% of US oil is foreign- recession empirically follows US Environmental Protection Agency 11 (“Reduced Oil Dependence Costs”, http://www.fueleconomy.gov/feg/oildep.shtml) OP

Today, over half of the oil we use is imported (57%), and our dependence will increase as we use up domestic resources. Most of the world's oil reserves are concentrated in the Middle East, and about two-thirds are controlled by OPEC members. Oil price shocks and price manipulation by OPEC have cost our economy dearly—about $1.9 trillion from 2004 to 2008—and each major shock was followed by a recession.

### US dependence on oil endangers its security and economy-gulf spill proves Times of India 10 (“Dependence on foreign oil endangers US' security, economy: Obama”, 5-27-10, http://articles.timesofindia.indiatimes.com/2010-05-27/us/28297806\_1\_clean-energy-economy-oil-companies-barack-obama) OP

WASHINGTON: The United States' dependence on foreign oil endangers its security and economy, President, Barack Obama has said. "We all know the price we pay as a country as a result of how we produce and use - and, yes, waste - energy today. We have been talking about it for decades - since the gas shortages of the 1970s. Our dependence on foreign oil endangers our security and our economy," Obama said in his speech on the economy in California. He said that climate change poses a threat to the US way of life. "In fact, we are already beginning to see its profound and costly impact. And the spill in the Gulf, which is just heartbreaking, only underscores the necessity of seeking alternative fuel sources.

## Solvency- Economy

### Reduced dependence key to economic recovery- must invest in clean energy Lefton and Weiss 10 (Rebecca, Researcher for Progressive Media and Daniel J., Senior Fellow and Director Climate Strategy at the Center for American Progress., “Oil Dependence Is a Dangerous Habit”, 1-13-10, http://www.americanprogress.org/issues/2010/01/oil\_imports\_security.html) OP

A recent report on the November 2009 U.S. trade deficit found that rising oil imports widened our deficit, increasing the gap between our imports and exports. This is but one example that our economic recovery and long-term growth is inexorably linked to our reliance on foreign oil. The United States is spending approximately $1 billion a day overseas on oil instead of investing the funds at home, where our economy sorely needs it. Burning oil that exacerbates global warming also poses serious threats to our national security and the world’s security. For these reasons we need to kick the oil addiction by investing in clean-energy reform to reduce oil demand, while taking steps to curb global warming.

### Energy efficiency bolsters national security and shields the economy from crisis NRDC 4 (Natural Resources Defense Council, “Reducing America's Energy Dependence”, 7-2-04, http://www.nrdc.org/air/transportation/gasprices.asp#head5) OP

There is absolutely no reason why our elected leaders should not make a national commitment to reducing America's dependence on oil by investing in energy efficiency. This goal can be achieved through increased fuel economy for automobiles, greater use of renewable fuels, and other readily available measures. Based on today's oil prices, taking these commonsense steps would save Americans more than $20 billion dollars in annual crude oil costs -- while also reducing smoggy skies and combating global warming. Kicking our addiction to oil will not only achieve real, consistent savings for Americans at the pump and improve our environment, but reducing our oil imports also will bolster national security and shield the economy from market manipulation and price shocks. The United States has a proud history of technological innovation, and American companies have the know-how to solve our oil insecurity. We just need the political will of Congress and the Bush administration to deliver on this promise. So far, our political leaders have failed to put forth a serious plan to increase our nation's energy security.

## \*\*\*Middle East Oil\*\*\*

## Inh- ME oil imports now

### America is becoming increasingly dependent on unstable, undemocratic Middle Eastern countries NRDC 4 (Natural Resources Defense Council, “Reducing America's Energy Dependence”, 7-2-04, http://www.nrdc.org/air/transportation/gasprices.asp#head5) OP

America's oil habit not only pinches our pockets and fuels OPEC's rising profits, but it also threatens our economy, national security and environment. According to the Department of Energy, the United States currently uses nearly 20 million barrels of oil a day, importing 55 percent of it. We spend more than $20 billion each year on oil from the Middle East. Twenty years from now, U.S. consumption will rise to 28.3 million barrels of oil a day, with 70 percent of it imported. This heavy reliance on foreign oil makes America increasingly dependent on some of the least stable, undemocratic countries in the world.

### US imports a ton of oil from the Middle East- hamstrings US energy policy

Feldstein 1 (Martin, Professor of Economics, Harvard University, and President of the National Bureau of Economic Research, http://www.nber.org/feldstein/oil.html) OP

The terrorist attacks on September 11th and the subsequent demonstrations of anti-Americanism throughout the Middle East increase the saliency of America's dependence on oil imports from the Gulf states. The United States now imports more than half of all the oil that we consume. One fourth of those imports come from Saudi Arabia, Kuwait, and Iraq. If there is no change in policy, that dependence will grow in the future since those three countries plus the United Arab Emirates have more than half of the world's reserves of oil while the United States has only 2 percent of total reserves. (2) America's dependence on imported oil is a serious cause of economic vulnerability and a major constraint on our foreign defense policy. The political leaders in the Middle East know that our dependence on their oil gives them leverage over our policies. The possibility of increasing that leverage emboldened Saddam Hussein to invade Kuwait in order to extend the share of mid-East oil controlled by Iraq. And while the governments of Saudi Arabia and Kuwait are basically friendly to the United States, recent events have made it clear how potentially vulnerable those governments are to radical elements within their own countries. All of this is a cloud over the continuation of oil supply from the Middle East. Political leaders and expert commissions have been calling for a reduction in our dependence on oil imports at least since 1974 when President Nixon established Project Independence with the goal of achieving energy independence by 1980. In fact, however, our dependence on imported oil was still 42 percent of our consumption in 1980 and has risen to 52 percent in 2000. (3)

### Global dependence on Middle East oil now

### Luft 08 (Gal, executive director of the Institute for the Analysis of Global Security (IAGS), “Dependence on Middle East Energy and its Impact on Global Security”, 6-2-08, http://www.thecuttingedgenews.com/index.php?article=537) OP

The concentration of so much of the world’s hydrocarbons in this geographical location means that as long as the modern economy depends on the supply of oil and natural gas, the Middle East will play a key role in global politics and economy. As it is, most of the world’s countries are heavily dependent on Persian Gulf oil. In 2006, the Middle East supplied 22 percent of U.S. imports, 36 percent of OECD Europe’s, 40 percent of China’s, 60 percent of India’s, and 80 percent of Japan’s and South Korea’s. Even oil-rich Canada is dependent on the Middle East. Forty five percent of Canada’s oil imports originate in the region. Barring a major technological transformation, global dependency on the Middle East is only going to grow. According to the International Energy Agency, from now to 2030, world oil consumption will rise by about 60 percent. Transportation will be the fastest growing oil-consuming sector. By 2030, the number of cars will increase to well over 1.25 billion, from approximately 700 million today. Consequently, global consumption of gasoline could double. The two countries with the highest rate of growth in oil use are China and India, whose combined populations account for a third of humanity. In the next two decades, China's oil consumption is expected to grow at a rate of 7.5 percent per year and India’s at a rate of 5.5 percent, compared to 1 to 3 percent growth for the industrialized countries. As a result, by 2030 Asia will import 80 percent of its total oil needs and 80 percent of this total will come from the Persian Gulf. The reason why Persian Gulf countries’ share of the world’s energy pie is likely to increase has to do not only with geology but also with resource management. While non-Middle East countries pump at full speed, Middle East producers, many of them members of the Organization of Petroleum Exporting Countries (OPEC), stick to a quota and produce well under their capacity. This means that non-OPEC oil is running out almost twice as fast as OPEC’s. Exxon Mobil Corporation has estimated that non-OPEC production—this includes Russia and West Africa—will peak within a decade, making recoverable oil left outside the Middle Eastern world scarcer and scarcer. On the other hand, the reserve-to-production ratio among Persian Gulf producers ranges between 80 and 100 years, allowing those countries to stay in the race decades after their competitors have depleted their reserves. This is likely to lead to global dependence on the region of unprecedented scale, with considerable implications for global security and economy. The Chief Economist of the International Energy Agency stated, “We are ending up with 95 percent of the world relying for its economic wellbeing on decisions made by five or six countries in the Middle East.”

## ME Dependence = War

### Continued oil dependence causes US war in Middle East- foreign policy historically influenced by oil need

Reynolds ’10 (Lewis, an economist and former investment bank executive with inside knowledge of the energy industry. “Seven Dangerous (and Surprising) Side Effects of the U.S. Dependency on Foreign Oil” http://www.amerisurv.com/content/view/7708/. 04 August 2010) AP

It creates strained foreign relations and sets the stage for an unstable future. The entire U.S.-Middle East foreign policy has been structured around the obvious importance of the region for the world’s oil supply. Policy makers don’t like to discuss it openly, but oil is always the elephant in the room when it comes to U.S. foreign relations—even with nations outside the Middle East. One of the great questions in the context of geopolitical struggle for oil is whether the great oil consuming nations—which will soon include the U.S., China, Russia—will view one another as allies, competitors, or some combination of both. The U.S. has love-hate relationships with both countries. There is historic rivalry between the U.S. and Russia leading back generations. The relationship with China is murky at best. Events are already in motion that could set the stage for a U.S.-Chinese confrontation. Oil consumption continues to grow modestly in the U.S., but in China it is exploding. On a global scale, oil consumption will certainly continue to grow into the foreseeable future, yet there are considerable questions as to whether global production can be increased much beyond current levels if at all. With both the U.S. and China needing oil, competition is inevitable. Responsibility lies with both sides to take actions to avoid the long progression toward a conflict. A Sino-American energy war is far too likely if both countries continue on their present courses without developing substantial alternative energy sources. It gets us into wars. Oil has been at the center of many (indeed most) major military conflicts in the world, particularly those involving the West. From providing the impetus for Hitler’s invasion of the Soviet Union and Japan’s attack on Pearl Harbor in World War II to Saddam Hussein’s invasion of Kuwait, the resulting Gulf War, and, most would admit, the U.S. return to Iraq in 2003, oil has bred a century of conflict. To be sure, America has made some bad choices to guarantee the uninterrupted flow of oil, often acting in ways very much in conflict with our national identity. Although the costs of the wars we have fought, both in terms of blood and treasure, have been great, the compromise of American values is perhaps even more disturbing. It might be best to look at the war issue in the context of a war that hasn’t happened…yet. Take the U.S. relationship with Iran. For most of the 20th century, the U.S. and British governments supported dictators and manipulated the domestic political situation in Iran to ensure the continued flow of cheap oil, often at the expense of the nation’s people. Those policies backfired when the harsh rule of the U.S.-backed Shah was overthrown by a popular revolution. The Iranian population was left angry with the U.S., and the door was opened for the anti-American Islamic theocracy that followed. The path to power for the Iranian regime was laid, in no small part, by mistakes made by previous U.S. Administrations.

### Continued oil dependence causes US war in Middle East- oil based economy drives conflicts

PBS ’02 (Public Broadcasting Service, Roper Poll-certified as America’s most trusted national institution. “What Have Been the Role and Effects of U.S. foreign policies and actions in the Middle East” http://www.pbs.org/wgbh/globalconnections/mideast/questions/uspolicy/index.html#us\_oil. 2002” AP

U.S. troops have seen limited action in the Middle East. As peacekeepers in Lebanon after Israel's 1982 invasion, U.S. forces fared poorly. Two hundred forty-one Marines were killed when their barracks was hit by a suicide truck-bomb in October 1983, prompting a U.S. withdrawal from Beirut to offshore warships. After a 1986 discotheque bombing in West Berlin was traced to Libya, the U.S. bombed that country, killing three dozen civilians, including Libyan ruler Muammar Qaddafi's adopted daughter. The most significant direct U.S. military intervention came in response to the Iraqi invasion of oil-rich Kuwait in August of 1990, which led to the Gulf War. Although the invasion didn't directly threaten American territory, a vital U.S. economic interest -- oil -- was at stake, along with principles of international law that protect the sovereignty and territorial integrity of nations. The Gulf War won the U.S. the gratitude of the oil-rich states of the Persian Gulf for eliminating the Iraqi military threat, but these regimes have had to deal with increased internal criticism for allowing U.S. troops to remain in Saudi Arabia. A member of the U.S. Air Force hands out candy to Kurdish children in a village in northern Iraq, August 1995. The Gulf War also left charges that the U.S. had abandoned some of its most vulnerable allies. The Kurds and Shiis of Iraq were encouraged to revolt against Saddam Hussein by the U.S., with assurances of U.S. support. But little support materialized when the uprising actually got under way, and Iraqi retaliation against both rebelling groups was harsh. Limited U.S. intervention allowed the creation of Kurdish safe havens in the north and assisted Shii refugees fleeing into Iran in the south, but charges that the U.S. abandoned its regional allies linger to this day, leading to skepticism that George W. Bush's call for a new government in Iraq would be accompanied by full American support. The U.S. and oil While American interest in the region isn't motivated by the pursuit of fossil fuels alone, the historically complicated U.S. relationships with Iran, Iraq, and the Gulf states have often revolved around oil -- specifically, ensuring an adequate supply at a reasonable cost. The Khawr Al Kafka oil terminal in the Persian Gulf. Since Standard Oil's 1936 discovery of massive oil deposits in Saudi Arabia, ensuring access to the region's fossil fuels has been on America's foreign policy agenda. The 1973-1974 OPEC oil boycott and the invasion of Kuwait in 1990 are both dramatic examples of how regional forces have challenged U.S. access to fuel. The 1973 boycott was particularly powerful; at the time, Arab nations supplied 37 percent of the oil consumed by the noncommunist world. To this day, ensuring the supply of oil from the region factors heavily in the development of U.S. foreign policy in the Middle East.

### Continued oil dependence causes US war in Middle East – intervention in Libya proves

UPI ’11 (United Press International, Worldwide Newswire. “Libyan war about oil, U.S. lawmaker says” http://www.upi.com/Business\_News/Energy-Resources/2011/03/22/Libyan-war-about-oil-US-lawmaker-says/UPI-48361300801026/. March 22, 2011) AP

WASHINGTON, March 22 (UPI) -- One of the primary reasons for the U.S. military intervention in Libya is because of the dependence on foreign oil, a Democratic lawmaker charged. A U.S. fighter jet crashed in Libya while on a mission that was part of an international effort to put pressure on Libyan leader Moammar Gadhafi. The U.N. Security Council last week passed a resolution that allowed for military intervention in Libya to protect the civilian population. U.S. Rep. Ed Markey, D-Mass., the former chairman of the Select Committee on Energy Independence and Global Warming, told MSNBC, however, that a primary reason for intervention was oil. "We're in Libya because of oil," he said. "And I think both Japan and the nuclear technology and Libya and this dependence that we have upon imported oil have both once again highlighted the need for the United States to have a renewable energy agenda going forward." Markey earlier said U.S. President Barack Obama was right to back the Security Council resolution permitting the use of force in Libya. This, he said, was consistent with U.S. commitments to helping the people meet their political aspirations. "But it all goes back to the 5 million barrels of oil that we import from (the Organization of the Petroleum Exporting Countries) on a daily basis," he told MSNBC. The International Energy Agency said it could be "many months" before Libyan crude returns to the market. Libya before the war was responsible for slightly more than 4 percent of the OPEC's output.

## ME Dependence Bad- laundry list

### Oil dependency bad- regional instability and prolif, US-China conflict, terrorism

### Institute for the Analysis of Global Security 3 (The Institute for the Analysis of Global Security (IAGS) is a non-profit organization which directs attention to the strong link between energy and security, “The Future of Oil”, http://www.iags.org/futureofoil.html) OP

The energy security and national security concerns that stem from reliance on a single energy resource that is unevenly distributed throughout the world will be intensified as demand for oil grows. The result will probably be: A handful of Middle East suppliers will regain the influence they had in the 1970s and once again be able to dictate the terms on world oil markets and manipulate oil prices and world politics. Middle Eastern producers will continue to use their oil revenues to increase their military expenditures, fuel an arms race and undermine regional stability. Corrupt, oppressive regimes will continue to use oil revenues as a means to maintain their power. Wealth generated by oil rich Middle Eastern countries will continue to flow into terrorist organizations and organizations promoting radical Islam. The U.S. will need to keep increasing American military presence in the region to ensure our access to the remaining oil. This will mean further U.S. embroilment in Middle East conflicts, more anti-American sentiment, and a deepening rift between the West and the Islamic world. Tension between the U.S. and China due to growing Chinese intervention in the Middle East to ensure its own access to oil and Chinese arming of Middle Eastern countries hostile to the U.S. and its allies. Further drain on economic resources caused by imports of expensive oil. Such an international system is not sustainable. It is in our best interest to preemptively embark on a revolutionary change that will lead us away from oil dependency rather than drag our feet and suffer the ramifications of becoming growingly dependent on a diminishing resource.

### Middle East Oil dependence hurts US security and fuels terrorism.

NRDC ’04 (Natural Resources Defense Council, environmental action group with 1.3 million members and the courtroom clout and expertise of more than 350 lawyers, scientists and other professionals. ”Safe, Strong and Secure: Reducing America's Oil Dependence” http://www.nrdc.org/air/transportation/aoilpolicy2.asp. 10/27/2004) AP

America spends more than $200,000 per minute on foreign oil -- $13 million per hour. More than $25 billion a year goes for Persian Gulf imports alone. This NRDC analysis considers oil demand and supply projections and how our current policy of oil dependence effects our economy and security. America's dependence on oil is a threat to our national security and our economy. Growing demand and shrinking domestic production means America is importing more and more oil each year - much of it from the world's most unfriendly or unstable regions. We spend more than $200,000 per minute -- $13 million per hour -- on foreign oil, and more than $25 billion a year on Persian Gulf imports alone.1 By October 2004, Americans had shelled out $249 per capita to foreign oil-interests.2 With U.S. gasoline consumption accounting for 11 percent of world oil production, the U.S. has been hit hard by our dependence on oil, intensifying our economic and political vulnerability. Of the $54 billion trade deficit reported in August, more than a fifth or $12 billion is from imported crude oil.3 Federal Reserve Chairman Alan Greenspan has called the higher value of imported oil a tax on U.S. citizens that has cost us three quarters of a percent of our economic output in 2004, and warned economic impacts for the U.S. will intensify if current trends in oil demand and prices continue.4 Countries on U.S. oil purchases are spending heavily in Washington to make sure the party doesn't end: Since December 2003, OPEC has spent $13.3 million on federal lobbying, $6.6 million of which from Saudi Arabia alone.5 U.S. energy companies are jumping on the political bandwagon too, spending $59.4 million on lobbying in 2003 and $29 million on campaign contributions in the 2002 and 2004 election cycles.6 The immediate result of these contributions is an energy bill currently before Congress that would leave the country more dependent on oil imports, not less. It would invite oil drillers into some of America's last pristine wilderness areas to eke out a relative trickle of oil, while severely shortchanging conservation and efficiency efforts. And this plan would rely even more on shaky overseas governments, exposing us to greater security risks in the name of unrestrained consumption. In fact, we simply cannot drill our way out of this problem (Figure 1). The U.S. has just three percent of know oil reserves; even drilling in the pristine Arctic National Wildlife Refuge would increase those reserves by less than one-third of one percent. Meanwhile, even OPEC is quickly exhausting excess production capacity according to the Federal Reserve. Looking beyond OPEC offers no comfort. Investment in new production capacity continues to lag in non-OPEC countries, limiting any near-term growth in output.7 In short, the system has reached its limit. Today's oil use outpaces new oil discoveries, with the world using about 12 billion more barrels per year than it finds.8 The growing imbalance between supply and demand means record high crude prices and the threat of more skyrocketing costs caused by even mild supply disruptions. The only real solution is to reduce our demand for oil and therefore the economic and security risks of dependence on imports. It starts with increasing the efficiency of our cars and trucks, and developing more renewable sources of energy. Using technology available right now, America can save 2.5 million barrels of oil each day. Solutions range from better tires to cutting edge hybrid technology. We've done it before: Passenger car and light truck fuel efficiency increased 70 percent between 1975, when the fuel economy law was originally enacted, and its peak in 1987. Since then we've been moving backward. Overall mileage of our new cars and trucks has steadily dropped. Today it's at its lowest level in 20 years. While domestic oil production peaked in the 1970s, consumption continues to grow at break-neck speed. In 2025 the U.S. is projected to consume 28.3 million barrels a day -- 44 percent more oil than we do today, with domestic production meeting a mere 30 percent of that need (see figure 2). Other countries will increasingly compete with the U.S. for the oil available for export. Consumption by industrializing nations will double over the next 25 years, from 15 to 32 million barrels a day. To meet projected world demand of 118 million barrels a day in 2025, global oil output would have to expand by more than 50 percent -- 40 million barrels per day -- between 2002 and 2025. For example, China's per-capita oil consumption is just six percent of the U.S. figure. But rapid industrialization and a growing consumer demand mean China's thirst for imported oil is likely to quadruple from less than 2 million barrels per day in 2004 to nearly 8 million barrels per day by 2020 (see figure 3).9 The growing problem is not lost on the Chinese government. China recently took an important step towards reducing their booming demand by creating a new system of fuel economy standards that U.S. experts say are more stringent than our own.10 With stubbornly high prices, the U.S. economy is feeling the drag of dependence. In the first nine months of 2004, the U.S. exported $72.5 billion for oil.11 Every day the U.S. pays out $390 million for foreign oil, with half of every dollar going to OPEC and a quarter to the Persian Gulf (see figure 4). While some of those dollars could make their way back into the U.S. economy, recent trends suggest that those paid out to OPEC will not be reinvested here.12 And OPEC countries are profiting handsomely from surging oil prices; in fact, they are expected to pocket $300 billion by the end of the year.13 The high costs of oil have been passed on to consumers at the pump, through more expensive goods and services, and in a weaker job market and lower stock prices.14 Economist Philip Verleger finds that oil price spikes have cumulatively sapped 15 percent of our economy's growth since the Second World War, resulting in $1.2 trillion in direct losses.15 The total economic penalty of our oil dependence, including loss of jobs, output, and tax revenues, is estimated to be between $297 and $305 billion annually.16 Arab OPEC states supply the United States with 2.5 million barrels per day -- 25 percent of our daily imports. Unless things change, the future holds more of the same: The Middle East countries hold two thirds of the world's proven oil reserves.17 By 2025, the Middle East is expected to supply 36 percent of the world's oil, with OPEC as a whole producing 46 percent.18 Attempting to address this challenge, the Bush administration national energy policy targets eight nations for increased government investment and closer political alliances as alternative oil suppliers.19 But these eight nations -- Angola, Azerbaijan, Colombia, Kazakhstan, Mexico, Nigeria, Russia and Venezuela - have just a fraction of the oil reserves of the countries they're meant to counter (Figure 5). Total proven reserves of these countries, 198 billion barrels, is 70 percent lower than Persian Gulf reserves, with only 30 years of remaining reserves at 2003 production levels.20 In comparison, the Persian Gulf has almost 100 years of proven reserves at 2003 production levels. And all the major alternative players face significant political and social instability and remain porous to global terrorism, making it difficult to attract foreign investments necessary to increase production.21 Take Nigeria: Nigeria currently supplies the United States with 11 percent of daily imports.22 The West African nation has been wracked with political and environmental strife since it declared independence from Britain in 1960, and remains seriously unstable today. Recent rebel activity spurred Shell Oil to evacuate employees and drove oil to a record highs.23 Nigeria currently produces approximately 2.2 million barrels per day and holds three percent of world oil reserves.24 Or Venezuela: The United States receives 13 percent of its daily oil imports from Venezuela, slightly less than our imports from Saudi Arabia.25 This South American country has faced numerous labor and street demonstrations in recent years. Leftist President Hugo Chavez has cracked down on such activities, but at one point in 2002 even he was forced to flee the presidential palace for the security of a military base.26 A second general strike is late 2002 and early 2003 involved 18,000 workers for the state oil company, causing jittery markets and price spikes.27 More recently, Chavez suddenly increased taxes on foreign oil producers from one percent to 17 percent, claiming that "We are no longer going to give away our oil."28 Venezuela produces 2.99 million barrels of oil per day and holds 6.8 percent of the world's proven oil reserves. Or Russia: Although Russia supplies only 1.5 percent of our daily imports, it produces 11.4 percent of the world's oil, pumping out 8.5 million barrels per day. Political squabbles and market uncertainty surrounding the criminal indictment of Yukos Oil, one of Russia's largest producers, rocked the market this year. Today Russia holds six percent of the world's proven oil reserves, however most of that oil is trapped in Siberia, and it is doubtful Russia's production would ever exceed that of Saudi Arabia.29 Furthermore, the instability and hostility fueled by Russia's military involvement with Chechnya, Georgia, and other lower Republics is deeply rooted in the struggle over oil pipelines to the Persian Gulf, a conflict that will continue to complicate Russia's potential as a supplier of oil. The U.S. can become more secure by putting America's factories and farms to work to reduce our thirst for foreign oil. Instead of investing hundreds of billions of dollars expanding oil production in the Persian Gulf and other unstable regions, America needs to be investing in revitalizing its factories to build fuel-efficient cars and its farms to create renewable fuel supply. Passenger vehicles are the single largest driver of United States oil consumption. But thanks to legal loopholes, the average fuel economy of America's cars and trucks has been getting worse for a decade. This pattern can be broken by providing automakers with incentives to retool their factories to produce more efficient vehicles and create new jobs, raising fuel efficiency standards, expanding the market for gasoline-electric hybrid vehicles through tax incentives, and investing in alternative fuels, such as biofuels or hydrogen. To immediately ease our oil addiction, the US should make a national commitment to reduce our oil dependency by at least 2.5 million barrels per day within a decade and to set longer term goals that secure our energy future without depending on unstable and hostile areas of the world. Technologies exist today to cut oil consumption while saving money. We can improve the fuel economy in cars, trucks and SUVs of all sizes and reduce oil consumed in factories and homes. America's farmers can turn crops and waste into "biofuels," displacing oil. Additional oil savings can be achieved by increasing the use of renewable, non-petroleum fuels, expanding transit options, encouraging smart growth development that makes communities more livable with less driving, increasing the efficiency of heavy trucks and aviation, expanding programs to weatherize oil-heated homes, and helping businesses adopt more efficient production processes. Over the longer run, we can replace the oil in our car and trucks with renewably produced hydrogen or biofuels.30 But it won't happen until leaders in Washington and Detroit make it happen. Instead, our energy policy leaves us too dependent on oil and the unstable regimes that supply it. We can and must reclaim our freedom and secure a cleaner, safer energy future by investing in American jobs and taking the lead on efficient technology, alternative fuels, more transportation choices, and other commonsense policies.

### Oil dependence for energy drives debt, funds terrorism, empowers terrorism, and pollutes

Woolsey ’10 (R. James, a foreign policy specialist and former Director of Central Intelligence and 16th head of the Central Intelligence Agency. “A Plan B for Obama” http://www.foreignpolicy.com/articles/2010/10/11/a\_plan\_b\_for\_obama?page=0,2. November 2010) AP

Americans borrow $1 billion a day to import oil. This is a huge share of the U.S. trade deficit and a major factor in weakening the dollar. Hundreds of billions a year go to the Middle East and end up funding improvised explosive devices and Wahhabi schools, which teach hatred of other religions, the stoning of women, death to apostates and homosexuals, and the need to work toward a worldwide caliphate. It is not an accident that 8 of the 10 largest oil exporters are dictatorships or autocratic kingdoms whose rulers profit massively from oil's gigantic economic rents. Oil also causes terrible environmental problems. Not only are its carbon emissions nearly as much as those of coal, but the so-called "aromatics" (benzene, toluene, and xylene) that constitute about one-quarter of what's in our gasoline tanks are highly carcinogenic. Careful and authoritative studies put the cost of dealing with the aromatics' damage to our health and consequently shortened life spans at well over $100 billion annually. For too long, American politicians have said that "foreign oil" is a problem and then gone on to propose ineffective or impossibly expensive solutions. Barack Obama needs to move away from oil, period. "Drill, baby, drill" can help some with the U.S. balance of payments, but will do nothing to undermine OPEC's control of the oil market. Nor are expensive nuclear power plants or wind farms the answer -- only 2 percent of U.S. electricity comes from oil. Cap and trade? The only major environmental policy measure that Obama has seized on is possibly a useful tool, if done right, for discouraging high-carbon electricity generation -- but it has almost nothing to do with oil's use in transportation. And besides, Obama hasn't been able to get it passed by Congress -- nor will he. Obama should not devote resources to solutions, such as hydrogen, that will take many years to develop and have high infrastructure costs. Instead, he should turn to a portfolio of steps that can move the United States off oil in the near term. Here are five things he can do now: 1) Create incentives for the large-scale production of plug-in hybrid cars and all-electric vehicles; 2) Mandate that fleet vehicles, such as city buses and some interstate trucking, be fueled with natural gas; 3) Follow Brazil's lead and move to an open-standard, flexible-fuel vehicle requirement so that alcohol fuels can compete with gasoline; 4) Require drastic efficiency increases for internal combustion engines; and 5) Encourage auto companies to move toward carbon composites, which will lighten automobiles and require smaller engines to propel them. Even if each of these solutions reduced oil transportation demand by only about 10 percent over the next decade, Obama could shatter oil's transportation monopoly -- now about 95 percent in the United States. If the president doesn't take such steps immediately, Americans face a grim future: falling ever more heavily into debt, funding terrorism, empowering dictators, contributing to climate change, and giving themselves cancer.

## ME Dependence = Terrorism

### Further dependence aids Middle Eastern terrorist organizations Luft 08 (Gal, executive director of the Institute for the Analysis of Global Security (IAGS), “Dependence on Middle East Energy and its Impact on Global Security”, 6-2-08, http://www.thecuttingedgenews.com/index.php?article=537) OP

Growing dependence on the Middle East means further enrichment of the corrupt and dictatorial regimes in the Persian Gulf and continued access of terrorist groups to a viable financial network which allows them to remain a lethal threat to the West. It would also necessitate increased Western military presence in the region to ensure access to oil. But such presence would only strengthen the xenophobic and anti-Western sentiment among the jihadists and increase their motivation to fight the infidels. Furthermore, continuous infusion of money to radical Islamic educational institutions creates a new generation of radicalized youth, making reconciliation between the West and the Muslim world more difficult to achieve. This vicious cycle can only be broken through massive political reforms that the oil regimes currently seem to resist.

### Middle East terrorist organizations funded by US oil consumers Reynolds 10 (Lewis, energy consultant and author of “America the Prisoner: The Implications of Foreign Oil Addiction and a Realistic Plan to End It”, “Seven Dangerous Side Effects of the U.S. Dependency on Foreign Oil”, 8-8-10, http://peakoil.com/production/seven-dangerous-side-effects-of-the-u-s-dependency-on-foreign-oil/) OP

The consequence is that, to a large extent, governments in the Middle East are funded by American consumers. The same money you use to fill your gas tank is ultimately funding things like terrorist groups and the Iranian nuclear program, but, perhaps more importantly, it is being used to buy assets in the United States. At the end of 2008, foreigners owned $3.5 trillion more in assets in the U.S. than Americans owned abroad, and the bulk of that difference can be explained by the oil trade deficit. The petroleum trade deficit is a wealth transfer. In 2008 alone, Americans purchased $453 billion of foreign oil (which accounted for more than 65 percent of the total trade deficit).

### Oil dependency makes us vulnerable to terrorist attacks. Reynolds 10 (Lewis, energy consultant and author of “America the Prisoner: The Implications of Foreign Oil Addiction and a Realistic Plan to End It”, “Seven Dangerous Side Effects of the U.S. Dependency on Foreign Oil”, 8-8-10, http://peakoil.com/production/seven-dangerous-side-effects-of-the-u-s-dependency-on-foreign-oil/) OP

It makes us vulnerable to terrorist attacks. Terrorism is a reality of the modern world. Terrorism is not the product of Islam; rather it is the manifestation of a particular political agenda. All terrorist groups in the Middle East share a hatred for Israel, but seldom have major attacks impacting the United States had much to do with our support of Israel. Instead, most of these groups’ grievances relate to the effects of oil policies.

## SBSP solves ME Oil dependence

### US has strong dependence on Middle East for oil-SBSP is a viable alternative Green Living 9 (“Steps to Reduce Oil Dependency”, http://www.greenlivingearth.net/tag/reduce-oil-dependency/) OP

Before discussing the various steps and measures that can be taken to reduce oil dependency, we need to know what oil dependence is. It is estimated that the United States uses 20 million barrels of oil a day. Of this, nearly 55 percent is imported. More than $20 billion is spent on importing oil from the Middle East every year. This makes the United States rely heavily on the Middle East for oil resources. The cause of oil dependence has led to an alarming increase in the demand for fuel supplies. This is mainly due to the use of fuel-inefficient vehicles, cars, and trucks. The growing demand for oil in the developing nations also adds to this problem. Immediate measures must be taken to reduce oil dependency to solve this problem. The use of alternative energy sources is one solution to reduce oil dependence. Of the many, biofuel and space-based solar power are being regarded as highly viable alternative energy sources.

### SBSP can prevent Middle East dependence Morring 7 (Frank Jr., senior editor at Aviation Week, “NSSO Backs Space Solar Power”, 10-11-07, http://www.aviationweek.com/aw/generic/story\_channel.jsp?channel=space&id=news/solar101107. xml) OP

Collecting solar power in space and beaming it back to Earth is a relatively near-term possibility that could solve strategic and tactical security problems for the U.S. and its deployed forces, the Pentagon's National Security Space Office (NSSO) says in a report issued Oct. 10. As a clean source of energy that would be independent of foreign supplies in the strife-torn Middle East and elsewhere, space solar power (SSP) could ease America's longstanding strategic energy vulnerability, according to the "interim assessment" released at a press conference and on the Web site spacesolarpower.wordpress.com.

## \*\*\*Resource Wars\*\*\*

## Oil Dependence 🡪 Resource Wars

### Resource wars and heg decline inevitable in the squo- oil production peak and other fossil fuels’ peak approaching

**Heinberg ’05** (Richard Heinberg, American journalist and educator who has written extensively on ecological issues, including oil depletion. He is the author of at least ten books. “The Party’s Over - Oil, War, and the fate of Industrial societies”. June 1, 2005) AP

Regional rivalries and long-term strategy: Even without competition for energy resources, the world is full of conflict and animosity, For the most part, it is in the United States\* interest to prevent open confrontation between regional rivals, such as India and Pakistan, Israel and Syria, and North and South Korea. However, resource competition will only worsen existing enmities. As the petroleum production peak approaches, the US will likely make efforts to take more direct control of energy resources in Saudi Arabia, Iran, the Caspian Sea, Africa and South America — efforts that may incite other nations to form alliances to curb US ambitions. Within only a few years, OPEC countries will have control over virtually all of the exportable surplus oil in the world (with the exception of Russia's petroleum, the production of which may reach a second peak in 2010, following an initial peak that precipitated the collapse of the USSR). The US — whose global hegemony has seemed so complete for the past dozen years — will suffer an increasing decline in global influence, which no amount of saber rattling or bombing of "terrorist" countries will be able to reverse. Awash in debt, dependent on imports, mired in corruption, its military increasingly overextended, the US is well into its imperial twilight years. Meanwhile, whichever nations seek to keep their resources out of the global market will be demonized. This has already occurred in the cases of Iran, Iraq, and Libya — which sought to retain too large a share of their resource profits to benefit their own regimes and hence attained pariah status in the eyes of the US government. Essentially they were seeking to do something similar to what the American colonists did in throwing off British rule over two centuries earlier. Like the American colonists, they wanted to control their own natural resources and the profits accruing from them. Many readers will object to such an analogy between American colonial patriots and modern-day Iibyan or Iraqi leaders on the grounds that the latter are, or were, autocrats guilty of human-rights abuses that justified their condemnation by the international community. But we must recall that America's founders were themselves engaged in slavery and genocide and that many US client states — including Turkey, Israel, Indonesia, and Saudi Arabia — have also been guilty of serious abuses.51 In the future, secure access to resources will depend not only on the direct control of oil fields and pipelines but also on successful competition with other bidders for available supplies. Eventually, the US will need to curtail European and Japanese access to resources wherever possible. Again, every effort will be made to avoid direct confrontation because in open conflict all sides will lose. Even the closest trading partners of the US — Canada and Mexico, which are currently major energy-resource suppliers — will become competitors for their own resources when depletion reaches a point where those nations find it hard to maintain exports to their energy-hungry neighbor and still provide for the needs of their own people. Civil wars will be likely to erupt in the less-industrialized nations that have abundant, valuable, and accessible resources, such as oil, natural gas, and diamonds, rather than in those that are resource-poor. This conclusion is based on a correlation study by Indra de Soysaof the University of Bonn of the value of natural resources in 139 countries and the frequency of civil wars since 1990." The finding runs counter to the long-held assumption that internecine warfare is most likely to occur in resource-poor countries. Often rival groups within nonindustrial countries use wealth from the sale of resources — or from leases to foreign corporations to exploit resources — in order to finance armed struggles. Pity the nations with resources remaining. The least industrialized of the world's nations will face extraordinary challenges in the decades ahead, hut may also enjoy certain advantages. Industrialized nations will seek to choke off the flow of energy supplies to resource-poor economies, most likely by yanking their debt chains and enforcing still more structural-adjustment policies. However, less-industrialized nations are able to squeeze much more productivity out of energy resources than are the energy-saturated economies of the industrialized nations. Less-industrialized nations are therefore potentially able to bid prices higher, or to absorb higher energy costs much faster, than the industrialized nations. This is only one of many wild cards in the longer-term game that will be played out as the world's energy resources slowly dribble away.

## SBSP solves Resource Wars

### SBSP prevents resource wars- ensures global energy security

David ’07 (Leonard, Research Associate for Secure World Foundation and served as Director of Research for the National Commission on Space. “Article: Space Based Solar Power Fuels Vision of Global Energy Security” http://www.space.com/4371-space-based-solar-power-fuels-vision-global-energy-security.html. September 19, 2007) AP

BRECKENRIDGE, Colorado – The deployment of space platforms that capture sunlight for beaming down electrical power to Earth is under review by the Pentagon, as a way to offer global energy and security benefits – including the prospect of short-circuiting future resource wars between increasingly energy-starved nations. A proposal is being vetted by U.S. military space strategists that 10 percent of the U.S. baseload of energy by 2050, perhaps sooner, could be produced by space based solar power (SBSP). Furthermore, a demonstration of the concept is being eyed to occur within the next five to seven years. A mix of advocates, technologists and scientists, as well as legal and policy experts, took part in Space Based Solar Power – Charting a Course for Sustainable Energy, a meeting held here September 6-7 and sponsored by the United States Air Force Academy?s Eisenhower Center for Space and Defense Studies and the Pentagon?s National Security Space Office. "I truly believe that space based solar power will become the first sellable, tradable commodity that’s delivered by space that everybody on the planet can have part of," said Colonel (Select) Michael Smith, Chief, Future Concepts in the National Security Space Office and director of the SBSP study. To bolster such a vision, establishing a partnership of government, commercial and international entities is under discussion, he added, to work on infrastructure development that, ultimately, culminates in the fielding of space based solar power. The U.S. Department of Defense has an "absolute urgent need for energy," Smith said, underscoring the concern that major powers around the world – not just the United States – could end up in a major war of attrition in the 21st century. "We’ve got to make sure that we alleviate the energy concerns around the globe," he said. "Energy may well be the first tangible commodity returned from space," said Joseph Rouge, Associate Director of the National Security Space Office. "Geopolitics in general is going to be a large issue. I don?t think there?s any question that energy is going to be one of the key next issues, along with water ... that’s going to be the competition we’re going to fight." Rouge said that moving out on the proposed SBSP effort would be the largest space venture yet, making the Apollo Moon landing project "look like just a small little program." As a caveat, however, he noted that the U.S. Department of Defense is cash-strapped and is not the financial backer for such an endeavor. "But do look to us to help you develop the technologies and developing a lot of the other infrastructure," Rouge advised, seeing SBSP, for instance, as helping to spur a significant reduction in the cost of routine access to space for the U.S. and its allies. Trends of concern There is a compelling argument of synergy between energy security, space security and national security, observed Col. Michael Hornitschek, Co-Chair of the National Security Space Office Architecture Study on Space Based Solar Power. Hornitschek flagged "trends of concern" in dealing with the world-wide energy challenge, citing global population and escalating energy demands, as well as the portent of climate change. He also referred to U.S. loss in global market share and leadership, in addition to declines in research and development investments and a skilled workforce. Although space based solar power has been studied since the 1970s – by the Department of Energy, NASA, the European Space Agency, as well as the Japan Aerospace Exploration Agency – Hornitschek said that the idea has generally "fallen between the cracks" because no organization is responsible for both space programs and energy security. Over the last few decades, the march of technology useful to SBSP has been significant, said Neville Marzwell, Manager of Advanced Concepts and Technology Innovation at the Jet Propulsion Laboratory in Pasadena, California. "We have made tremendous progress in technology from 1977 to 2007," Marzwell reported. He pointed to advances in micro and nano-electronics, lightweight inflatable composite structures, ultra-small power management devices, as well as laboratory demonstration of photovoltaic arrays that are close to 68 percent conversion efficiency. Still, there?s work to be done, Marzwell emphasized, specifically in wireless power beaming. By modularizing SBSP platforms, the work can start small and foster batch production to keep price per unit costs down while evolving a bigger energy market, he said. Home run kind of situation Overall, pushing forward on SBSP "is a complex problem and one that lends itself to a wide variety of competing solutions," said John Mankins, President of Artemis Innovation Management Solutions, LLC, in Ashburn, Virginia. "There?s a whole range of science and technology challenges to be pursued. New knowledge and new systems concepts are needed in order to enable space based solar power. But there does not appear, at least at present, that there are any fundamental physical barriers," Mankins explained. Peter Teets, Distinguished Chair of the Eisenhower Center for Space and Defense Studies, said that SBSP must be economically viable with those economics probably not there today. "But if we can find a way with continued technology development ? and smart moves in terms of development cycles to bring clean energy from space to the Earth, it?s a home run kind of situation," he told attendees of the meeting. "It?s a noble effort," Teets told Space News. There remain uncertainties in SBSP, including closure on a business case for the idea, he added. "I think the Air Force has a legitimate stake in starting it. But the scale of this project is going to be enormous. This could create a new agency ? who knows? It?s going to take the President and a lot of political will to go forward with this," Teets said. Demonstration via satellite As current director of the SBSP study for the National Security Space Office, Smith said that demonstrations of beamed energy from space – utilizing both breadboard lab tests and by using space assets – are vital. One possibility is to extrapolate meaningful lessons from signal transmissions by already orbiting communication satellites, he said, be they U.S. assets or experiments done with partners elsewhere around the world. An orbiting SBSP demonstration spacecraft must be a useful tool, Smith added, to deliver energy while retiring science questions and identifying risk areas for next phase SBSP development. Conceptually, a locale to receive test broadcasts of beamed energy from space could be Creech Air Force Base in Indian Springs, Nevada, he noted. Mankins told Space News that the International Space Station could also be a venue from which to conduct a whole range of in-space SBSP-related experiments on relevant component technologies or subsystem technologies. "The space station is perfect for that," he said, perhaps making use of Japan?s still-to-be-lofted experiment module, Kibo, and its Exposed Facility located outside of the pressurized module.

### SBSP solves resource wars Popular Mechanics 9 (“Space-Based Solar Power Beams Become Next Energy Frontier”, 10-1-09, http://www.popularmechanics.com/science/space/4230315) OP

The idea of using satellites to beam solar power down from space is nothing new--the Department of Energy first studied it in the 1970s, and NASA took another look in the '90s. The stumbling block has been less the engineering challenge than the cost. A Pentagon report released in October could mean the stars are finally aligning for space-based solar power, or SBSP. According to the report, SBSP is becoming more feasible, and eventually could help head off crises such as climate change and wars over diminishing energy supplies. "The challenge is one of perception," says John Mankins, president of the Space Power Association and the leader of NASA's mid-1990s SBSP study. "There are people in senior leadership positions who believe everything in space has to cost trillions." The new report imagines a market-based approach. Eventually, SBSP may become enormously profitable--and the Pentagon hopes it will lure the growing private space industry. The government would fund launches to place initial arrays in orbit by 2016, with private firms taking over operations from there. This plan could limit government costs to about $10 billion. As envisioned, massive orbiting solar arrays, situated to remain in sunlight nearly continuously, will beam multiple megawatts of energy to Earth via microwave beams. The energy will be transmitted to mesh receivers placed over open farmland and in strategic remote locations, then fed into the nation's electrical grid. The goal: To provide 10 percent of the United States' base-load power supply by 2050. Ultimately, the report estimates, a single kilometer-wide array could collect enough power in one year to rival the energy locked in the world's oil reserves.

### Space Energy modified 11 (the leading commercial enterprise in the field of renewable energy, “Why Space Energy”, modified 7-15-11, http://spaceenergy.com/About/WhySpaceEnergy.htm) OP

It is an indisputable fact that global energy usage is at record high and continuing to rise fast. Demand in several areas of the global economy is already outpacing supply. Traditional hydrocarbon energy reserves are depleting at an ever increasing rate and most experts agree that there is only enough proven uranium reserves to last one more generation. In addition, the use of hydrocarbon and nuclear fuels are widely acknowledged to be leading contributors to significant environmental and health problems. As developing countries continue to grow and embank on major electrification efforts, energy shortages will become one of the most serious challenges facing governments this century. China and India alone will need to raise energy generating capacity by a staggering 4 to 5 times over the next 20 years in order to meet demand – an equivalent of bringing on-line two large coal-fired power stations per week, every week. The risk of energy shortages could mean more than high prices. In the 20th century, many wars were motivated in part by the need to secure future energy supplies - and, according to the U.S. Pentagon, the risk of such conflict remains high in the 21st century. (See the paper "War Without Oil.") Safe, reliable, renewable, base-load power that is affordable and widely available has long been the ‘holy grail’ of researchers and scientists in the energy industry. Aside from averting conflict associated with resource wars, abundant clean energy has the potential to truly improve life around the world in many ways. Rural electrification can offer one of the fastest ways out of poverty for developing areas. It can ensure that food and medicines are preserved and made available where they are needed the most. It can provide power for water purification and desalination and light so that children can study and develop their potential. This is why Space Energy is committed to harnessing existing and new methods for clean energy generation and transmission, such as from ground-based solar power and space-based solar power.

## Resource wars turn all other impacts

### Loss of natural resources create intractable security threats – poverty, ethnic violence, insurgent attack

Parthemore and Rogers 10 (Christine and Will, fellows at the Center for New American Security, “Sustaining Security,” June 2010. <http://www.cnas.org/files/documents/publications/CNAS\_Sustaining%20Security\_Parthemore%20Rogers.pdf>)

According to an analysis by the United Nations, at least 11 violent conflicts since 1990 have been fueled in part by the degradation of renewable natural resources.⁵ While this is a concern in itself, the incidence of resource-driven conflicts may only grow if natural resources become scarcer over time, commensurate with population growth and unsustainable patterns of development. As the global population steadily climbs toward a projected nine billion in 2050 and global levels of consumption increase dramatically,⁶ this growth is increasing demand for natural resources and putting unprecedented pressure on the global natural resource base. How we define security must account for these factors, and efforts to ensure U.S. interests must also address natural resource degradation. Of course, the natural resource trends discussed in this report are not by themselves threats. Natural resource degradation does contribute to poverty, migration, resource competition, weak social institutions and other trends that more directly feed intrastate conflicts such as ethnic clashes and insurgencies in developing countries. However, scholars since the end of the Cold War have suggested that these variables are complex and the progression from natural resource scarcity to conflict is far from inevitable. Societies can and do avoid what one scholar calls “demographic and environmental stress” as a partial cause of conflict. Countries with higher levels of political inclusivity and lower levels of ethnic, religious or other social divisions can more easily take action to overcome such stresses.⁷ But in states with many social divisions, where some groups are not included in decision making, natural resource degradation can play a larger role in creating the conditions for civil conflict: instability and weakened states that can undermine regional stability, affect trade and cause refugee and other humanitarian crises that sap the military, civilian and financial resources of developed countries.⁸ One military scholar has characterized natural resource scarcity as one of a handful of systemic vulnerabilities that, left unaddressed, have the potential to combine and intensify over time, creating intractable security threats that defy traditional security responses (e.g., a military response akin to conventional combat operations).⁹ Security forces may struggle to respond adequately to ethnic violence, for example, or highly asymmetrical attacks by small groups of insurgents. It is difficult to know exactly what role natural resource degradation plays in these types of conflicts, but it is plausible that they could become a more important factor as natural resource scarcity worsens. These types of conflicts and instabilities might never be as conspicuous as interstate wars, but they could seriously compromise the security of the United States and its allies. Resource-related civil conflict and instability particularly affect developing nations because local communities and groups depend to such a great extent on natural resources for their economic growth and, often, subsistence. Additionally, developing countries sometimes lack political and social institutions resilient enough to cope with these challenges

## \*\*\*Oil Impacts\*\*\*

## Turns heg

### SBSP is key to break oil dependence which is key to US leadership

Bonnici 9 (Alex Michael Bonnici Ph.D, Presenter and European Union Liason for the NSS, “Solar Power Satellites: The Yes Case”, http://www.discovery-enterprise.com/2009/01/solar-power-satellites-yes-case.html, 1/20/09) SV

The answer to this question is a resounding yes! And, may this answer reverberate throughout the scared halls of Congress and the parliaments of the free world. The time is now for the governments of the United States and the free world to commit themselves to the development of space based solar power in earth orbit or based on the lunar surface. This commitment has been long overdue and the United States of America and its allies have waited far too long to take a real and major concerted leadership role in the development of this vast untapped resource. A commitment to space based solar power is vital to the long term national security, economic and environmental concerns of the United States and the world. America and the rest of the free world can no longer afford to remain the economic and political captives of nations and despotic regimes that neither share our democratic values nor love for individual human liberty. Yet our political adversaries control the strategic mineral and energy resources vital to our economic growth and prosperity. The United States and the free world can no longer allow themselves to remain bound by this status quo and must seek to change it. America in particular must not relinquish nor endanger its leadership role as defender of the free world by making political and diplomatic compromises with these autocratic nations. And, neither should it allow itself to be forced to engage in reckless military actions that would compel other nations to question America’s real commitment to democratic values throughout the rest of the world in order to secure its hold on these resources. The United States of America and the nations of the free world must commit themselves to a long term program of energy independence and give up our debilitating addiction to Mid-eastern oil and our dependency on strategic minerals located in the most politically unstable and volatile regions of the World. For the whole of the preceding century and the first decade of this century we have been almost entirely reliant on fossil fuels. That was fine when fossil fuels were cheap and the full impact of their use on the environment was never fully understood. But, now it has become crystal clear that there are many hidden costs involved with our sole dependency on oil and other fossil fuels. These hidden costs are not just environmental but, as outlined above geopolitical and military in nature and effect the short and long term economic and political stability of the entire world.

## Turns Terrorism/Anti-Americanism

### Foreign dependency gives anti-American governments leverage – economic and military

Wald et al 9 (General Charles F Wald, Former Deputy Commander, Headquarters U.S. European Command, General Gordon R. Sullivan, Former Chief of Staff, U.S. Army, and Former Chairman of the CNA MAB, Vice Admiral Richard H. Truly, Former NASA Administrator, Shuttle Astronaut and the ﬁrst Commander of the Naval Space Command, “Powering America’s Defense,” May 2009. <http://www.cna.org/sites/default/files/Powering%20Americas%20Defense.pdf>)

The West’s dependence on oil has helped a small group of nations emerge as new energy powerhouses. The vast majority of oil reserves (and speciﬁc knowledge of those reserves) is controlled not by publicly traded companies, but by national governments, which control 77 percent of the world’s estimated 1.15 trillion barrels of proven reserves [4]. In addition, 16 of the top 25 oil-producing companies are either majority or wholly state-controlled [5]. These oil reserves can give extraordinary leverage to countries that may otherwise have little; some are using that power to harm Western governments and their values and policies. Venezuela, which depends on oil revenues for more than half of its federal budget [6], offers an interesting case study in this regard. Oil forms a strong economic bond between Venezuela and the U.S.: Venezuela provides roughly 11 percent of U.S. oil imports, the U.S. makes up 60 percent of Venezuelan oil exports, and Venezuela has partial or complete ownership of nine U.S.-based reﬁneries [7, 8]. However, Venezuela’s democratically elected President, Hugo Chavez, regularly espouses anti-American and anti-Western rhetoric both at home and abroad. Venezuela promotes a destabilizing and anti-U.S. inﬂuence in parts of Latin and South America through foreign aid (largely in the form of subsidized oil); its oil wealth has also enabled Venezuela to engage in a large buildup of arms and equipment [7, 9]. Venezuela’s oil wealth has not only helped Chavez expand his inﬂuence regionally; it has also helped him cling to power at home. Chavez has directed billions of dollars in oil revenues to this end by funding free medical clinics, new schools and adult education programs, and other social initiatives. Oil wealth has also helped Chavez to silence his domestic critics and extinguish freedom of the press [7]. Russia is another nation whose international connections largely depend on its energy exports. Russia is the world’s largest exporter of natural gas and the second largest exporter of oil (although its production is in decline due to lack of investment) [10]. Europe is particularly dependent upon Russia for natural gas, receiving 40 percent of its supplies through old Soviet pipelines now owned by Ukraine and Belarus. In turn, Russia is deeply dependent upon gas from Central Asian countries, notably Turkmenistan, to ﬁll those pipelines after meeting its own domestic needs. Not having diversiﬁed its economy enough, the Russian government is dependent upon its revenues from energy sales to fund its domestic programs and stimulate its economy. Such dependence, combined with volatile prices, has caused Russia to take harsh actions over price disputes and unpaid natural gas bills: Russia has halted gas supplies to Ukraine and Belarus (and thus to much of Europe) in the middle of winter on three occasions in recent years [11, 12, 13]. Some international observers have suggested that Russia has been using its energy supplies as a bargaining chip in negotiations over issues such as the European-based U.S. missile shield and NATO’s discussions with Ukraine [14].

### Oil spending funds terrorism

Wald et al 9 (General Charles F Wald, Former Deputy Commander, Headquarters U.S. European Command, General Gordon R. Sullivan, Former Chief of Staff, U.S. Army, and Former Chairman of the CNA MAB, Vice Admiral Richard H. Truly, Former NASA Administrator, Shuttle Astronaut and the ﬁrst Commander of the Naval Space Command, “Powering America’s Defense,” May 2009. <http://www.cna.org/sites/default/files/Powering%20Americas%20Defense.pdf>)

Another troubling aspect of our oil addiction is the resulting transfer of wealth. American and overall world demand for oil puts large sums in the hands of a small group of nations; those sums, in the hands of certain governments or individuals, can be used to great harm. Iran’s oil exports, which reached an estimated $77 billion in 2008, provide 40 percent of the funding for a government that the U.S. State Department says is the world’s “most active state sponsor of terrorism” [15]. Iran provides materiel to Hezbollah, supports insurgents in Iraq, and is pursuing a nuclear weapons program [16]. While the U.S. does not trade directly with Iran, many of our allies do (including Japan, South Korea, Italy, and France) [17]. Saudi Arabian private individuals and organizations, enriched by the country’s $301 billion in estimated 2008 oil, reportedly fund organizations that promote violent extremism revenues [18]. The sad irony is that this indirectly funds our adversaries. As former CIA Director James Woolsey said, “This is the ﬁrst time since the Civil War that we’ve ﬁnanced both sides of a conﬂict” [19]. America’s strategic leadership, and the actions of our allies, can be greatly compromised by a need (or perceived need) to avoid antagonizing some critical oil suppliers. This has become increasingly obvious since the early 1970s, when the ﬁrst OPEC embargo quadrupled oil prices, contributed to an inﬂationary spiral, and generated tensions across the Atlantic as European nations sought to distance themselves from U.S. policies not favored by oil-exporting nations [20]. Today, while the U.S. has been openly critical of the political environments in some of the world’s major oil producers (such as Venezuela and Iran), oil has been the central factor in the mutually supportive relationship between the U.S. and Saudi Arabia. While the Saudis have been key allies in the region since World War II and serve as one of the nation’s most critical oil suppliers [21], Saudi Arabia is also one of the most repressive governments in the world. Even in countries that are not major suppliers for the U.S., the presence of oil deposits has complicated the ability of the U.S. and the international community to promote Western values and stability [22]. The presence of the world’s third largest oil reserves—and a line of willing customers— have contributed to the Iranian government’s ability to pursue its nuclear weapons program in the face of international sanctions [17, 23]..

## China War

### Oil dependency creates US-China competition- war inevitable without alternative energy Reynolds 10 (Lewis, energy consultant and author of “America the Prisoner: The Implications of Foreign Oil Addiction and a Realistic Plan to End It”, “Seven Dangerous Side Effects of the U.S. Dependency on Foreign Oil”, 8-8-10, http://peakoil.com/production/seven-dangerous-side-effects-of-the-u-s-dependency-on-foreign-oil/) OP

It creates strained foreign relations and sets the stage for an unstable future. The entire U.S.-Middle East foreign policy has been structured around the obvious importance of the region for the world’s oil supply. Policy makers don’t like to discuss it openly, but oil is always the elephant in the room when it comes to U.S. foreign relations—even with nations outside the Middle East. One of the great questions in the context of geopolitical struggle for oil is whether the great oil consuming nations—which will soon include the U.S., China, Russia—will view one another as allies, competitors, or some combination of both. The U.S. has love-hate relationships with both countries. There is historic rivalry between the U.S. and Russia leading back generations. The relationship with China is murky at best. Events are already in motion that could set the stage for a U.S.-Chinese confrontation. Oil consumption continues to grow modestly in the U.S., but in China it is exploding. On a global scale, oil consumption will certainly continue to grow into the foreseeable future, yet there are considerable questions as to whether global production can be increased much beyond current levels if at all. With both the U.S. and China needing oil, competition is inevitable. Responsibility lies with both sides to take actions to avoid the long progression toward a conflict. A Sino-American energy war is far too likely if both countries continue on their present courses without developing substantial alternative energy sources.

## Iran War

### Oil dependency causes war with Iran Reynolds 10 (Lewis, energy consultant and author of “America the Prisoner: The Implications of Foreign Oil Addiction and a Realistic Plan to End It”, “Seven Dangerous Side Effects of the U.S. Dependency on Foreign Oil”, 8-8-10, http://peakoil.com/production/seven-dangerous-side-effects-of-the-u-s-dependency-on-foreign-oil/) OP

It gets us into wars. Oil has been at the center of many (indeed most) major military conflicts in the world, particularly those involving the West. From providing the impetus for Hitler’s invasion of the Soviet Union and Japan’s attack on Pearl Harbor in World War II to Saddam Hussein’s invasion of Kuwait, the resulting Gulf War, and, most would admit, the U.S. return to Iraq in 2003, oil has bred a century of conflict. To be sure, America has made some bad choices to guarantee the uninterrupted flow of oil, often acting in ways very much in conflict with our national identity. Although the costs of the wars we have fought, both in terms of blood and treasure, have been great, the compromise of American values is perhaps even more disturbing. It might be best to look at the war issue in the context of a war that hasn’t happened…yet. Take the U.S. relationship with Iran. For most of the 20th century, the U.S. and British governments supported dictators and manipulated the domestic political situation in Iran to ensure the continued flow of cheap oil, often at the expense of the nation’s people. Those policies backfired when the harsh rule of the U.S.-backed Shah was overthrown by a popular revolution. The Iranian population was left angry with the U.S., and the door was opened for the anti-American Islamic theocracy that followed. The path to power for the Iranian regime was laid, in no small part, by mistakes made by previous U.S. Administrations.

## Environment

### Oil hurts environment- BP spill proves Reynolds 10 (Lewis, energy consultant and author of “America the Prisoner: The Implications of Foreign Oil Addiction and a Realistic Plan to End It”, “Seven Dangerous Side Effects of the U.S. Dependency on Foreign Oil”, 8-8-10, http://peakoil.com/production/seven-dangerous-side-effects-of-the-u-s-dependency-on-foreign-oil/) OP

It’s harmful to the environment. Oil spills, global warming, carbon emissions, greenhouse gases—these are just a few of the hazards connected to our dependency on oil. Fossil fuels are dirty, nasty, icky substances, and the nature and scale of the international oil extraction effort guarantees that there will be accidents. Tankers leak, as was the case of the Exxon Valdez, and BP-style explosions happen. As serious as all of these accidents are, they could be minor compared to the potential impact from what is not an accident—the burning of fossil fuels. The total global emissions grew at 1.1 percent during the 1990s, but grew at the alarming rate of 3.3 percent between 2000 and 2004. This rapid increase in growth can be attributed in large part to the accelerating industrialization and economic growth in the developing world, China and India particularly.

## Democracy

### Oil dependence prevents democratization Luft 08 (Gal, executive director of the Institute for the Analysis of Global Security (IAGS), “Dependence on Middle East Energy and its Impact on Global Security”, 6-2-08, http://www.thecuttingedgenews.com/index.php?article=537) OP

Studies show that countries rich in easily extracted and highly lucrative natural resources that do not have well-developed democratic traditions, do not sufficiently invest in education, productivity, or economic diversification. In addition, such resource-rich governments do not feel obligated to be accountable or transparent to their people and they deny them representation. They also have no imperative to educate women and grant them equal rights. While their oil wealth allows them to be the strategic pivot of world politics and economy, the record of these “trust fund states” on human rights, political stability, and compliance with international law, is abysmal. Some Persian Gulf countries have made an effort not to repeat the reckless spending policies that accompanied previous spikes in oil prices by diversifying their investment portfolios and strengthening their non-oil sector. But they still continue to use oil revenues as a means to maintain their power. Thus freedom and democracy advance at an extremely slow pace, if at all. In some places the petrodollars influx only causes a reversal in the progress toward freedom. As New York Times columnist Thomas Friedman noted in what he calls “the first law of petropolitics,” the price of oil and the pace of freedom always move in opposite directions in authoritarian countries highly dependent on oil and gas for their GDP. If democratization makes any significant progress in the Middle East it only happens in countries that do not rely on energy exports like Jordan, Bahrain, or Morocco.

## \*\*\*Russia Add On\*\*\*

### The US will shape the new energy economy and be a model for other countries like Russia

Roberts 04 (Paul, regular contributor to Harpers Magazine and “expert on the complex interplay of economics, technology, and the environment, The End of Oil, p. 14-5)

But by necessity, much of this book will focus on the United States. For all that the new energy economy is an international issue, no nation will play a greater role in the evolution of that economy than ours. Americans are the most profligate users of energy in the history of the world: a country with less than 5 percent of the worlds population burns through 25 percent of the worlds total energy. Some of this discrepancy is owing to the American economy, which is bigger than anyone else's and therefore uses more energy. But it is also true that the American lifestyle is twice as energy-intensive as that in Europe and Japan, and about ten times the global average. The United States is thus the most important of all energy players: its enormous demand makes it an essential customer for the big energy states like Saudi Arabia and Russia. Its large imports hold the global energy market in thrall. (Indeed, the tiniest change in the U.S. energy economy — a colder winter, an increase in driving, a change in tax law — can send world markets into a tailspin.) And because American power flows from its dominance over a global economy that in turn depends mainly on oil and other fossil fuels, the United States sees itself as having no choice but to defend the global energy infrastructure from any threat and by nearly any means available — economic, diplomatic, even military. The result of this simultaneous might and dependency is that the United States is, and will be, the preeminent force in the shaping of the new energy economy. The United States is the only country with the economic muscle, the technological expertise, and the international standing truly to mold the next energy system. If the U.S. government and its citizens decided to launch a new energy system and have it in place within twenty years, not only would the energy system be built, but the rest of the world would be forced to follow along.

Russia will transition to renewable resources

Russia Today 9 (“Russian renewable energy prepares for a bigger slice of the power pie”, 8-25-11, http://rt.com/business/news/russian-renewable-energy-potential/) OP

The natural environment provides Russia with possibly the world’s best scope for making use of the potential of renewable energy. Between the vast acreages of vegetation which could conceivably become biofuel raw materials, and some of the worlds largest virtually untapped snow fed rivers which could be harnessed further for hydro power, there’s also the geothermal energy potential of active tectonic zones in the far east, a belt across the country which could support solar power generation, and much of the same which could support wind power generation. Oleg Popel, a renewable energy expert at the Russian Academy of Sciences, notes that the potential depends on the region, and that in some areas a mix of renewable energy types is likely to be better than one variety alone, but that taken as a whole, Russia has massive renewable potential.

### Prevents resource wars caused by continued oil dependence

**Victor** 07 (David G., professor at Stanford Law School; director of the Program on Energy and Sustainable Development; senior fellow at the Council on Foreign Relations, The National Interest/Columbia International Affairs Online, Nov/Dec, What Resource Wars?, http://www.ciaonet.org/cgi- bin/dkv/ciao/querystring.pl?rq=0&ht=0&qp=&col=ciao&qc=ciao&qt=india+resource+war&x=0&y=0, 7/3/08)

THE SECOND surge in thinking about resource wars comes from all the money that is pulsing into resource-rich countries. There is no question that the revenues are huge. OPEC cashed $650 billion for 11.7 billion barrels of the oil it sold in 2006, compared with $110 billion in 1998, when it sold a similar quantity of oil at much lower prices. Russia’s Central Bank reports that the country earned more than $300 billion selling oil and gas in 2006, about four times its annual haul in the late 1990s. But will this flood in rents cause conflict and war? There is no question that large revenues—regardless of the source—can fund a lot of mischievous behavior. Iran is building a nuclear-weapons program with the revenues from its oil exports. Russia has funded trouble in Chechnya, Georgia and other places with oil and gas rents. Hugo Chávez opened Venezuela’s bulging checkbook to help populists in Bolivia and to poke America in ways that could rekindle smoldering conflicts. Islamic terrorists also have benefited, in part, from oil revenues that leak out of oil-rich societies or are channeled directly from sympathetic governments. But resource-related conflicts are multi-causal. In no case would simply cutting the resources avoid or halt conflict, even if the presence of natural resources can shift the odds. Certainly, oil revenues have advanced Iran’s nuclear program, which is a potential source of hot conflict and could make future conflicts a lot more dangerous. But a steep decline in oil probably wouldn’t strangle the program on its own. Indeed, while Iran still struggles to make a bomb, resource-poor North Korea has already arrived at that goal by starving itself and getting help from friends. Venezuela’s checkbook allows Chávez to be a bigger thorn in the sides of those he dislikes, but there are other thorns that poke without oil money. As we see, what matters is not just money but how it is used. While Al-Qaeda conjures images of an oil-

### And, Resource wars cause extinction

Klare 6 (Michael T. Klare Ph.D, Professor of peace and world security studies at Hampshire University, “The Coming Resource Wars” http://www.alternet.org/story/33243/the\_coming\_resource\_wars, 3/10/2006)SV

Although not unprecedented, Reid's prediction of an upsurge in resource conflict is significant both because of his senior rank and the vehemence of his Until now, this mode of analysis has failed to command the attention of top American and British policymakers. For the most part, they insist that ideological and religious differences -- notably, the clash between values of tolerance and democracy on one hand and extremist forms of Islam on the other -- remain the main drivers of international conflict. But Reid's speech at Chatham House suggests that a major shift in strategic thinking may be under way. Environmental perils may soon dominate the world security agenda. This shift is due in part to the growing weight of evidence pointing to a significant human role in altering the planet's basic climate systems. Recent studies showing the rapid shrinkage of the polar ice caps, the accelerated melting of North American glaciers, the increased frequency of severe hurricanes and a number of other such effects all suggest that dramatic and potentially harmful changes to the global climate have begun to occur. More importantly, they conclude that human behavior -- most importantly, the burning of fossil fuels in factories, power plants, and motor vehicles -- is the most likely cause of these changes. This assessment may not have yet penetrated the White House and other bastions of head-in-the-sand thinking, but it is clearly gaining ground among scientists and thoughtful analysts around the world. For the most part, public discussion of global climate change has tended to describe its effects as an environmental problem -- as a threat to safe water, arable soil, temperate forests, certain species and so on. And, of course, climate change is a potent threat to the environment; in fact, the greatest threat imaginable. But viewing climate change as an environmental problem fails to do justice to the magnitude of the peril it poses. As Reid's speech and the 2003 Pentagon study make clear, the greatest danger posed by global climate change is not the degradation of ecosystems per se, but rather the disintegration of entire human societies, producing wholesale starvation, mass migrations and recurring conflict over resources. "As famine, disease, and weather-related disasters strike due to abrupt climate change," the Pentagon report notes, "many countries' needs will exceed their carrying capacity" -- that is, their ability to provide the minimum requirements for human survival. This "will create a sense of desperation, which is likely to lead to offensive aggression" against countries with a greater stock of vital resources. "Imagine eastern European countries, struggling to feed their populations with a falling supply of food, water, and energy, eyeing Russia, whose population is already in decline, for access to its grain, minerals, and energy supply." Similar scenarios will be replicated all across the planet, as those without the means to survival invade or migrate to those with greater abundance -- producing endless struggles between resource "haves" and "have-nots." It is this prospect, more than anything, that worries John Reid. In particular, he expressed concern over the inadequate capacity of poor and unstable countries to cope with the effects of climate change, and the resulting risk of state collapse, civil war and mass migration. "More than 300 million people in Africa currently lack access to safe water," he observed, and "climate change will worsen this dire situation" -- provoking more wars like Darfur. And even if these social disasters will occur primarily in the developing world, the wealthier countries will also be caught up in them, whether by participatin9g in peacekeeping and humanitarian aid operations, by fending off unwanted migrants or by fighting for access to overseas supplies of food, oil, and minerals. When reading of these nightmarish scenarios, it is easy to conjure up images of desperate, starving people killing one another with knives, staves and clubs -- as was certainly often the case in the past, and could easily prove to be so again. But these scenarios also envision the use of more deadly weapons. "In this world of warring states," the 2003 Pentagon report predicted, "nuclear arms proliferation is inevitable." As oil and natural gas disappears, more and more countries will rely on nuclear power to meet their energy needs -- and this "will accelerate nuclear proliferation as countries develop enrichment and reprocessing capabilities to ensure their national security." Although speculative, these reports make one thing clear: when thinking about the calamitous effects of global climate change, we must emphasize its social and political consequences as much as its purely environmental effects. Drought, flooding and storms can kill us, and surely will -- but so will wars among the survivors of these catastrophes over what remains of food, water and shelter. As Reid's comments indicate, no society, however affluent, will escape involvement in these forms of conflict.

## \*\*\*AT: Russian Oil DA\*\*\*

## No link- transition will be slow

### Energy transitions are prolonged processes that take decades to have a global effect

**Smil modified 11** (Dr. Vaclav, Distinguished Professor in the Faculty of Environment at the University of Manitoba in Winnipeg, Canada, “considered to be one of the world's leading experts in energy”, Fellow of the Royal Society of Canada (Science Academy), “Energy transitions are inherently slow”, modified 12-20-11, http://ourenergyfutures.org/page-titre-Energy\_transitions\_are\_inherently\_slow-cid-23.html) OP

"Energy transitions" encompass the time that elapses between an introduction of a new primary energy source oil, nuclear electricity, wind captured by large turbines) and its rise to claiming a substantial share (20 percent to 30 percent) of the overall market, or even to becoming the single largest contributor or an absolute leader (with more than 50 percent) in national or global energy supply. The term also refers to gradual diffusion of new prime movers (e.g. such as diesel engines and turbines), devices that replaced animal and human muscles by converting primary energies into mechanical power that is used to rotate massive turbogenerators producing electricity or to propel fleets of vehicles, ships, and airplanes. There is one thing all energy transitions have in common: they are prolonged affairs that take decades to accomplish, and the greater the scale of prevailing uses and conversions the longer the substitutions will take.

### A full, global transition to renewables take centuries- empirically proven

**Fouquet 10** (Roger, Research Associate in Energy & Environmental Economics at Imperial College London, “The Slow Search for Solutions: Lessons from Historical Energy Transitions by Sector and Service”, http://www.google.com/url?sa=t&source=web&cd=2&ved=0CB8QFjAB&url=http%3A%2F%2Fwww.bc3research.org%2Findex.php%3Foption%3Dcom\_wpapers%26task%3Ddownpubli%26iddoc%3D16%26repec%3D1%26Itemid%3D279&rct=j&q=energy%20transitions%20into%20the%20market%20are%20slow&ei=n\_kmTpiLF8ytgQeS6aUN&usg=AFQjCNGwmRvEXOf7dqDy1lTprHhENPyO1w&sig2=QrP7vU83jLK0MLHlo2fY8g) OP

Although often considered a single event, the transition from traditional energy sources to fossil fuels was complex and involved numerous services and sectors at different times between 1500 and 1920.The main drivers for the energy transitions were the opportunity to produce cheaper or better energy services. In a majority of cases, the successful new energy source or technology provided the same service (i.e. heating, power, transport or light) with superior or additional characteristics (e.g. easier, cleaner or more flexible to use). The existence of a niche market willing to pay more for these characteristics enabled the new energy source and technology to be refined gradually until they could compete with the incumbent energy source. Nevertheless, this implied that, on average, the whole innovation chain took more than one hundred years and the diffusion phase nearly fifty years.

## Price Volatility Inevitable

### Price volatility is inevitable and shocks cause high prices.

Paul Roberts, regular contributor to Harpers Magazine and “expert on the complex interplay of economics, technology, and the environment, 2004 (The End of Oil, p. 93-4)

The obsessive focus on oil is hardly surprising, given the stakes. In the fast-moving world of oil politics, oil is not simply a source of world power, but a medium for that power as well, a substance whose huge importance enmeshes companies, communities, and entire nations in a taut global web that is sensitive to the smallest of vibrations. A single oil "event" — a pipeline explosion in Iraq, political unrest in Venezuela, a bellicose exchange between the Russian and Saudi oil ministers — sends Shockwaves through the world energy order, pushes prices up or down, and sets off tectonic shifts in global wealth and power. Each day that the Saudi-Russian spat kept oil supplies high and prices low, the big oil exporters were losing hundreds of millions of dollars and, perhaps, moving closer to financial and political disaster — while the big consuming nations enjoyed what amounted to a massive tax break. Yet in the volatile world of oil, the tide could quickly turn. A few months later, as anxieties over a second Iraq war drove prices up to forty dollars, the oil tide abruptly changed directions, transferring tens of billions of dollars from the economies of the United States, Japan, and Europe to the national banks in Riyadh, Caracas, Kuwait City, and Baghdad, and threatening to strangle whatever was left of the global economic recovery.

## No Diversification now

### Russia diversification fails- makes them more dependent on oil Gaddy 11 (Clifford, Senior Fellow at the Brookings Institute, economist specializing in Russia Foreign Policy, Global Economy and Development, Center on the United States and Europe, “Will the Russian Economy Rid Itself of Dependence on Oil?”, 6-16-11, http://www.brookings.edu/opinions/2011/0616\_ russia\_economy\_gaddy.aspx) OP

To ask whether the Russian economy will rid itself of its “dependence on oil” is to ask whether ideology will trump economics. Many people in Russia—including President Medvedev—seem to believe Russia should de-emphasize the role of oil, gas, and other commodities because they are “primitive.” Relying on them, they argue, is “degrading.” From the economic point of view, this makes no sense. Oil is Russia’s comparative advantage. It is the most competitive part of the economy. Oil and gas are something everyone wants, and Russia has more of them than anyone else. It is true that the Russian economy is backward, and that oil plays a role in that backwardness. But oil is not the root cause. The causes of Russia’s backwardness lie in its inherited production structure. The physical structure of the real economy (that is, the industries, plants, their location, work forces, equipment, products, and the production chains in which they participate) is predominantly the same as in the Soviet era. The problem is that it is precisely the oil wealth (the so-called oil rent) that is used to support and perpetuate the inefficient structure. For the sake of social and political stability, a large share of Russia’s oil and gas rents is distributed to the production enterprises that employ the inherited physical and human capital. The production and supply chains in that part of the economy are in effect “rent distribution chains.” A serious attempt to convert Russia’s economy into something resembling a modern Western economy would require dismantling this rent distribution system. This would be both highly destabilizing, and costly in terms of current welfare. Current efforts for “diversification” do not challenge the rent distribution system. On the contrary, the kinds of investment envisioned in those efforts will preserve and reinforce the rent distribution chains, and hence make Russia more dependent on oil rents.

## Russian Econ Defense

### Russian economy resilient

**Stokes 08** (Bruce Stokes. "Don't Ignore the Russian Bear." Council on Foreign Relations, http://www.cfr.org/publication/3225/dont\_ignore\_the\_russian\_bear.html)

A little less than a year ago, August 17 to be precise, the post-Cold War Russian economic experiment imploded. The ruble collapsed and debt payments to foreigners were frozen. Wall Street lost billions of dollars. Long Term Capital Management, one of the world's biggest hedge funds, had to be taken over by its bankers. Once burned, international investors yanked their capital out of all emerging markets— from Latin America to East Asia— causing world interest rates to spike. The global economy teetered on the edge of depression.   But, much to the surprise of most economic pundits, international markets quickly righted themselves. The Russian economy proved far more resilient than anticipated. And, in retrospect, the events of August, 1998 were little more than a very large bump in the road.   The lessons of this "crisis that wasn't" are now clear: Russia is not too big to fail (the volume of its debts do not dictate special treatment by its creditors); the financial world can cope with such failure; and the Russian economy can bounce back without much overt help from the West. But the impending $4.5 billion loan to Russia by the International Monetary Fund— reflecting Washington's gratitude for Moscow's help in Kosovo, continued fear of Russian nuclear proliferation and concern about Russia's internal political stability— demonstrates that Russia still remains too important for the world to ignore.

### Russian economic collapse is inevitable

**Khrushcheva 08** (Nina L. Khrushcheva is an associate professor of international affairs at the New School, Chronicle of Higher Education, 9-5)

That scenario, however, is unlikely. The unstable conditions that are stoking Russia's current economic boom may soon bring about a crisis similar to the financial meltdown of 1998, when, as a result of the decline in world commodity prices, Russia, which is heavily dependent on the export of raw materials, lost most of its income. Widespread corruption at every level of private and state bureaucracy, coupled with the fact that the government invests little of its oil money in fostering areas like technological innovation, corporate responsibility, and social and political reform, could spin the economic balance out of control. Rampant inflation might bring the Putin-Medvedev Kremlin down. Even if Russia withstands that scenario, global forces will ultimately burst its economic bubble. The temporary release of the U.S. oil reserves, and tough economic and legal sanctions against oil speculators around the world, should end Russia's oil supremacy and hasten its economic collapse. And sooner or later, alternative solutions to the world's dependence on oil and gas will be found.

### Russian economic collapse is inevitable

**Aslund 08** (Anders, Peterson Institute, Moscow Times, Sept 3, http://www.iie.com/publications/opeds/oped.cfm?ResearchID=997)

August 8 stands out as a fateful day for Russia. It marks Prime Minister Vladimir Putin's greatest strategic blunder. In one blow, he wiped out half a trillion dollars of stock market value, stalled all domestic reforms, and isolated Russia from the outside world. Russia's attack on Georgia, its small democratic neighbor, was bad enough, but its recognition of two conquered protectorates as independent states has been supported only by Hamas, Belarus, Venezuela, and Cuba. Putin is turning Russia into a rogue state. Russia has gone through a grand economic recovery, but its strength must not be exaggerated. In current dollars, its gross domestic product has increased almost ninefold in nine years, but even so, it accounts for only 2.8 percent of global GDP. At present, its per capita GDP of $12,000 is a quarter of the US level. While this is impressive, much of its catch-up potential has been exhausted. The official government target is to reach half the US per capita GDP by 2020. It is possible to achieve that goal, but it would require carrying out extensive economic reforms during the next 12 years. The problem, however, is that Russia's foreign aggression has strengthened the authoritarian regime, and this has ended all hopes for substantial reforms at a time when they are needed the most. To understand Russia's economic dilemma, we need to consider the causes of the country's growth over the last decade and the current challenges. The dominant cause of growth has been European or capitalist convergence, which Russia has enjoyed thanks to Boris Yeltsin's hard-fought introduction of a market economy, privatization, and international integration. The country's short economic history can be summed up as: All good comes from private enterprise. The government's contribution has been to keep the budget in surplus and reduce taxation. A second cause of the high growth has been the huge free capacity in production, infrastructure, and human capital after the collapse of communism. The recovery was also coupled with remonetization, as Russia has enjoyed one of the greatest credit booms of all time. With the rise of the new capitalist service sector, a huge structural change has spurred growth. Together, the systemic and structural changes amount to a gigantic catch-up effect that all postcommunist reform countries have experienced. The average annual real growth in former Soviet states from 2000 to 2007 was 9 percent, but it reached only 7 percent in Russia.The third factor behind Russia's growth is the most spurious—namely the oil price windfall since 2004. While it has boosted the country's budget surplus, current account balance, and currency reserves, it is likely to have damaged its policy badly, as the elite focused on the distribution of oil rents rather than on the improvement of policy. As a consequence, Russia has seen no economic or social reforms worth mentioning for the past six years. Moscow's current economic dilemma is that the old sources of growth will soon be exhausted. Undoubtedly, some capitalist convergence will continue, but it is bound to slow down. Unfortunately, it is easy to compile 10 reasons why Russia is likely to have lower growth in the near future than it has had for the last nine years. 1. Internationally, one of the greatest booms of all times is finally coming to an end. Demand is falling throughout the world, and soon Russia will also be hit. This factor alone has brought the Western world to stagnation. 2. Russia's main problem is its enormous corruption. According to Transparency International, only Equatorial Guinea is richer than Russia and more corrupt. Since the main culprit behind Russia's aggravated corruption is Putin, no improvement is likely as long as he persists. 3. Infrastructure, especially roads, has become an extraordinary bottleneck, and the sad fact is that Russia is unable to carry out major infrastructure projects. When Putin came to power in 2000, Russia had 754,000 kilometers of paved road. Incredibly, by 2006 this figure had increased by only 0.1 percent, and the little that is built costs at least three times as much as in the West. Public administration is simply too incompetent and corrupt to develop major projects. 4. Renationalization is continuing and leading to a decline in economic efficiency. When Putin publicly attacked Mechel, investors presumed that he had decided to nationalize the company. Thus they rushed to dump their stock in Mechel, having seen what happened to Yukos, Russneft, United Heavy Machineries, and VSMP-Avisma, to name a few. In a note to investors, UBS explained diplomatically that an old paradigm of higher political risk has returned to Russia, so it has reduced its price targets by an average of 20 percent, or a market value of $300 billion. Unpredictable economic crime is bad for growth. 5. The most successful transition countries have investment ratios exceeding 30 percent of GDP, as is also the case in East Asia. But in Russia, it is only 20 percent of GDP, and it is likely to fall in the current business environment. That means that bottlenecks will grow worse. 6. An immediate consequence of Russia's transformation into a rogue state is that membership in the World Trade Organization is out of reach. World Bank and Economic Development Ministry assessments have put the value of WTO membership at 0.5 to 1 percentage points of additional growth per year for the next five years. Now, a similar deterioration is likely because of increased protectionism, especially in agriculture and finance. 7. Minimal reforms in law enforcement, education, and health care have been undertaken, and no new attempt is likely. The malfunctioning public services will become an even greater drag on economic growth. 8. Oil and commodity prices can only go down, and energy production is stagnant, which means that Russia's external accounts are bound to deteriorate quickly. 9. Because Russia's banking system is dominated by five state banks, it is inefficient and unreliable, and the national cost of a poor banking system rises over time. 10. Inflation is now 15 percent because of a poor exchange rate and monetary policies, though the current capital outflow may ease that problem.In short, Russia is set for a sudden and sharp fall in its economic growth. It is difficult to assess the impact of each of these 10 factors, but they are all potent and negative. A sudden, zero growth would not be surprising, and leaders like Putin are not prepared to face reality. Russia's economic situation looks ugly. For how long can Russia afford such an expensive prime minister?

## Russia War Defense

### Zero probability of Russia war – economic interdependence, political and military stability prevent war

Graham 7 (Thomas, senior advisor on Russia in the US National Security Council, “The Dialectics of Strength and Weakness,” Russia in Global Affairs, September 2007. <eng.globalaffairs.ru/number/n\_9138>)

An astute historian of Russia, Martin Malia, wrote several years ago that “Russia has at different times been demonized or divinized by Western opinion less because of her real role in Europe than because of the fears and frustrations, or hopes and aspirations, generated within European society by its own domestic problems.” Such is the case today. To be sure, mounting Western concerns about Russia are a consequence of Russian policies that appear to undermine Western interests, but they are also a reflection of declining confidence in our own abilities and the efficacy of our own policies. Ironically, this growing fear and distrust of Russia come at a time when Russia is arguably less threatening to the West, and the United States in particular, than it has been at any time since the end of the Second World War. Russia does not champion a totalitarian ideology intent on our destruction, its military poses no threat to sweep across Europe, its economic growth depends on constructive commercial relations with Europe, and its strategic arsenal – while still capable of annihilating the United States – is under more reliable control than it has been in the past fifteen years and the threat of a strategic strike approaches zero probability. Political gridlock in key Western countries, however, precludes the creativity, risk-taking, and subtlety needed to advance our interests on issues over which we are at odds with Russia while laying the basis for more constructive long-term relations with Russia.

# \*\*\*Warming Advantage\*\*\*

## \*\*\*Solvency\*\*\*

## SBSP solves Warming

### SSP solves warming and gives us a crucial advantage on the battlefield and rural areas

Lemonick 09 (Michael, senior writer at Climate Central, Yale Environment 360, Solar Power from Space: Moving Beyond Science Fiction, http://e360.yale.edu/content/feature.msp?id=2184, JG)

A number of factors are driving the renewed interest in space-based solar power, including the push to cut greenhouse-gas emissions and growing interest from the military. But neither of these forces would mean much if the technology was outrageously expensive or too impractical. It was a little bit of both when SBSP was first proposed in 1968 by an engineer named Peter Glaser, who worked for the consulting firm Arthur D. Little on a variety of space-related projects. The basic components — solar cells and microwave transmitters and receivers — already existed, and as the Apollo program began to wind down, NASA was trying to figure out what to do next. In particular, says John Mankins, who became the manager for advanced concepts for NASA during the 1990s, “They were trying to figure out what to do with the space shuttle.” One idea was to begin launching space habitats — to get large numbers of people living and working in space. “These people would need something to do,” says Mankins, “so one idea was that they’d build solar-power satellites.” Studies showed that it was a feasible, but daunting, proposition. “This was in the days before PCs, microelectronics, robotics,” says Mankins. “The idea of something like the shuttle’s robotic arm was unimaginable. So you’d need these big crews to bolt the things together — and the satellites themselves would have had to be physically enormous. We’d need a new launch system that would dwarf the space shuttle.” The bottom line, he says, was that it could be done, but it would have cost At 22,000 miles up, a geostationary satellite is in full sunlight virtually all the time. the equivalent of a trillion of today’s dollars to get the first kilowatt of power, and it would have taken 20 years. “The National Research Council and the Office of Technology Assessment looked at it,” recalled Mankins. “One of them said, ‘Let’s revisit this in ten years.’ The other said, ‘Let’s never consider this again.’” In the mid-1990s, NASA did revisit the concept. Under Mankins’ direction, a team of engineers was assembled to see whether advances in technology made space-based solar power more feasible. “The basic answer,” he says, “was ‘yes.’” In the past decade two other factors have emerged to boost the prospects of SBSP: climate change and interest from the military. **There is a growing recognition that non-carbon energy sources will be crucial if the world is going to avoid the worst effects of climate change. It’s almost inevitable that carbon emissions will end up being taxed one way or another, and when they are, renewables like SBSP will immediately become more competitive economically.** That’s what motivates Solaren and PG&E. Although it is cloaking its work in secrecy, Solaren has said it will cost roughly $2 billion to launch a handful of satellites carrying the equipment that will be robotically assembled into a single, large solar station. One way the company plans to boost efficiency is to use parabolic reflectors to concentrate sunlight onto the solar cells. “The biggest expense,” says Cal Boerman, Solaren’s director of energy services, “is the cost of getting into space, and we’re convinced we can get the weight down to the point where we can… …By being an early customer, the government can rapidly accelerate development of the technology. we’re also interested in weaning ourselves off fossil fuels because climate change could pose national security risks.” But there would also be a tactical advantage to space-based solar, Damphousse noted. When the military is operating in remote regions of countries like Iraq or Afghanistan, it uses diesel generators to supply forward bases with power. “We have a significant footprint getting energy in,” says Damphousse, noting the need for frequent convoys of oil tankers, the soldiers to protect them, and air support — all of which is expensive and dangerous. Being able to tap into power beamed directly down from space would clearly have a lot of appeal, says Damphousse, **even if it were relatively costly**. And it’s not just useful for the battlefield, he says, but also for areas affected by natural disasters, such as Hurricane Katrina. For those reasons, Damphousse supports the idea of coordinated studies by the Pentagon and other agencies — such as NASA and the Department of Energy — that would have a stake in space-based power. “We might, for example, do some experiments on the International Space Station, which is already up there and generating 110 kilowatts of power from its own solar cells,” he says, “rather than having to send up a dedicated test satellite.” Such cooperation might appeal to NASA. “I suspect that NASA will start working on energy and on more advanced technology and less on, ‘Let’s get to the moon by 2018,’” says Mankins. By undertaking some of the research and being an early customer for SBSP, the government could rapidly accelerate development of the technology. Historians of aviation agree that the government’s decision to back air mail played a major role in developing the aircraft industry, leading to technological innovations and economies of scale. The same phenomenon could take an emerging but outlandish-sounding technology and push it into the energy mainstream.

### SSP Key to wane off of non-renewable energy – Most Feasable

Snead 09 (James M, The Space Review, The End of Easy Energy and What to Do About It, pdf, JG)

Finally, a key point to recognize about a U.S. commitment to pursue space solar power is that this inherently will involve the emergence of the United States as a true spacefaring nation with substantial spacefaring industrial and operational capabilities supporting growing U.S. commercial operations throughout the central solar system—as predicted by O’Neill over four decades ago. These circumstances are not unlike those at the beginning of the 1800’s. Then, the United States was a small coastal nation of about 5 million with territorial claims, obtained through treaty and purchase, to lands extending over two thousand miles to the west. Muscle, wind, and moving water powered its agrarian economy. Yet, at the end of the 1800’s, the United States emerged as a continental nation of 70 million. It was linked by over 200,000 miles of rail; was increasingly mechanically-powered using coal, oil, and natural gas; was developing local and regional electrical power and telephone communication networks; was building the first steel-framed skyscrapers; and, was beginning the scientific investigations of wireless communications and heavier-than-air powered flight that would further transform the world in the following century. When pushed forward by necessity and ambition, both in the 19th and 20th centuries, Americans have repeatedly demonstrated that substantial technological and societal progress is achievable within a century. Absent a breakthrough in affordable and safe advanced nuclear energy and/or the industrial-scale development of undersea methane hydrates, space solar power appears to be the new 21st century energy source that must be developed to alleviate the pending substantial U.S. and world shortfall in sustainable energy. The United States is, indeed, fortunate to have a capable aerospace industry around which this critical effort can be organized and to have a public that still has strong ambitions to see the United States become a true spacefaring nation. With the clear need for space solar power, space industrialization will become the primary “space race” of the 21st century.

### SSP Good – Solves Climate Change & Resource Wars

Sofge 09 (Eric, Popular Mechanics, Space-Based Solar Power Beams Become Next Energy Frontier, http://www.popularmechanics.com/science/space/4230315, JG)

The idea of using satellites to beam solar power down from space is nothing new--the Department of Energy first studied it in the 1970s, and NASA took another look in the '90s. The stumbling block has been less the engineering challenge than the cost. A Pentagon report released in October could mean the stars are finally aligning for space-based solar power, or SBSP. According to the report, SBSP is becoming more feasible, and eventually could help head off crises such as climate change and wars over diminishing energy supplies. "The challenge is one of perception," says John Mankins, president of the Space Power Association and the leader of NASA's mid-1990s SBSP study. "There are people in senior leadership positions who believe everything in space has to cost trillions." The new report imagines a market-based approach. Eventually, SBSP may become enormously profitable--9. The government would fund launches to place initial arrays in orbit by 2016, 9. This plan could limit government costs to about $10 billion. As envisioned, massive orbiting solar arrays, situated to remain in sunlight nearly continuously, will beam multiple megawatts of energy to Earth via microwave beams. The energy will be transmitted to mesh receivers placed over open farmland and in strategic remote locations, then fed into the nation's electrical grid. The goal: To provide 10 percent of the United States' base-load power supply by 2050. Ultimately, the report estimates, a single kilometer-wide array could collect enough power in one year to rival the energy locked in the world's oil reserves. While most of the technology required for SBSP already exists, questions such as potential environmental impacts will take years to work out.

### SPS solves for climate change, water quality and air quality

Lark 09 (Eva-Jane, Vice-President and Investment Advisor with BMO Nesbitt Burns, POLICY AND FINANCIAL CONSIDERATIONS AND PROSPECTS FOR SPACE SOLAR POWER, Political Incentives, http://evainterviews.files.wordpress.com/2009/05/policy-and-financial-considerations-and-prospects-for-space-solar-power.pdf, JG)

Until the onset of the recent international economic crisis, the effects of climate change and global warming were some of the leading public concerns for many nations. The financial crises of 2008 and worldwide recession have shifted most governments’ short term focus back to their economies but these issues are not forgotten, just moved to the back burner. Climate change, air quality and water quality are of major concern to policymakers and environmental policy is designed to address these issues. It is heavily related to energy policy as the burning of fossil fuels or anthropogenic causes are considered responsible for global warming. Environmental policy focuses primarily on encouraging favorable practices, limiting damage and ensuring the safety and health of that nation’s population. Policy initiatives may include: Greenhouse gas emissions levels Monitoring and regulating greenhouse gases Air and water pollution abatement strategies Waste management Nuclear or hazardous waste issues Endangered species Biodiversity Natural resource management Wildlife and ecosystem sustainability Government involvement in the environment is important because of the “tragedy of the commons”. The tragedy of the commons describes the problem that, because no one person owns the commons, each individual has an incentive to utilize common resources as much as possible, and care for it not at all. Without governmental involvement, the commons is overused50 and under cared for. The two general government approaches to environmental policy are usually forms of either “command and control”: regulations, restrictions, limits or mandates to use specified technology; or economic incentives: recognition for excellence, fines for poor results, tradable emissions/carbon credits, fees etc.51 Space Solar Power relates to environmental policy in that it is a clean, renewable, sustainable source of energy which does not add greenhouse gas emission or heat to Earth’s environment though the beaming and receiving processes.52 Research efforts to date suggest that not only are there less emissions but the safety and health concerns are minimal and the land below the rectenna can be used.

### SPS solve warming – Green energy production

Komerath 05 (Nayaranan, Professor School of Aerospace Engineering, Georgia Institute of Technology, An Evolutionary Model for Space Solar Power, Introduction, http://www.adl.gatech.edu/archives/adlp06020701.pdf, JG)

The key feature is to use the potential of the space-based infrastructure to boost terrestrial “green” energy production and thus benefit from the concerns about global warming and energy shortage. In this first paper on the concept, the scope of the project, possible benefits and the obstacles to success are considered. It is seen that the inefficiency of conversion to and from microwave poses the largest obstacle, and prevents favorable comparison with terrestrial high-voltage transmission lines. However, competitive revenue generation can come from the nonlinearity of cost with demand at various places on earth. Point delivery to small portable, mobile receivers during times of emergencies. The benefits to ‘green’ energy generation make the concept attractive for public support as a strategic asset. This also sets a market context for concepts to convert solar power directly to beamed energy – a prospect with many applications.

### SSP is THE solution for climate change

Snead 09 (James M, The Space Review, The Vital Need For America to Develop Space Solar Power, http://www.thespacereview.com/article/1364/1, JG)

We are left with SSP. Unless the US federal government is willing to forego addressing the very real possibility of energy scarcity in dispatchable electrical power generation, SSP is the one renewable energy solution capable of beginning engineering development and, as such, being incorporated into such a rational sustainable energy transition plan. Hence, beginning the engineering development of SSP now becomes a necessity.

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Of course, rapid advancements in advanced nuclear energy or methane hydrate recovery or the emergence of a new industrial-scale sustainable energy source may change the current circumstances favoring the start of the development of SSP. But not knowing how long affordable easy energy supplies will remain available and not knowing to what extent terrestrial nuclear fission and renewable energy production can be practically and politically expanded, reasonableness dictates that the serious engineering development of SSP be started now.

## AT: SBSP not sufficient

### SSP is sufficient to solve warming.

NSS 07 (National Space Society, Space Solar Power Limitless clean energy from space, About Space Solar Power (SSP, also known as Space-Based Solar Power, or SBSP):, http://www.nss.org/settlement/ssp/, JG)

The United States and the world need to find new sources of clean energy. Space Solar Power gathers energy from sunlight in space and transmits it wirelessly to Earth. Space solar power can solve our energy and greenhouse gas emissions problems. **Not just help, not just take a step in the right direction, but solve**. Space solar power can provide large quantities of energy to each and every person on Earth with very little environmental impact. The solar energy available in space is literally billions of times greater than we use today. The lifetime of the sun is an estimated 4-5 billion years, making space solar power a truly long-term energy solution. As Earth receives only one part in 2.3 billion of the Sun's output, space solar power is by far the largest potential energy source available, dwarfing all others combined. Solar energy is routinely used on nearly all spacecraft today. This technology on a larger scale, combined with already demonstrated wireless power transmission can supply nearly all the electrical needs of our planet. Another need is to move away from fossil fuels for our transportation system. While electricity powers few vehicles today, hybrids will soon evolve into plug-in hybrids which can use electric energy from the grid. As batteries, super-capacitors, and fuel cells improve, the gasoline engine will gradually play a smaller and smaller role in transportation — but only if we can generate the enormous quantities of electrical energy we need. It doesn't help to remove fossil fuels from vehicles if you just turn around and use fossil fuels again to generate the electricity to power those vehicles. Space solar power can provide the needed clean power for any future electric transportation system. While all viable energy options should be pursued with vigor, space solar power has a number of substantial advantages over other energy sources.

### SBSP completely solves our energy problems

**Cox 11** (William J. Cox, a retired prosecutor and public interest lawyer, author and political activist, “The Race for Space-Solar Energy”, http://www.truthout.org/race-space-solar-energy/1304186557, 4/30/11) SV

Space-solar energy is the greatest source of untapped energy that could, potentially, **completely solve** the world's energy and greenhouse gas emission problems. The technology currently exists to launch solar-collector satellites into geostationary orbits around the Earth to convert the sun's radiant energy into electricity 24 hours a day and to safely transmit the electricity by microwave beams to rectifying antennas on Earth. Following its proposal by Dr. Peter Glaser in 1968, the concept of solar power satellites was extensively studied by the US Department of Energy (DOE) and the National Aeronautics and Space Administration (NASA). By 1981, the organizations determined that the idea was a high-risk venture; however, they recommended further study. With increases in electricity demand and costs, NASA took a "fresh look" at the concept between 1995 and 1997. The NASA study envisioned a trillion-dollar project to place several dozen solar-power satellites in geostationary orbits by 2050 that would send between two gigawatts and five gigawatts of power to Earth. The NASA effort successfully demonstrated the ability to transmit electrical energy by microwaves through the atmosphere; however, the study's leader, John Mankins, now says the program "has fallen through the cracks because no organization is responsible for both space programs and energy security." The project may have remained shelved except for the military's need for sources of energy in its campaigns in Iraq and Afghanistan, where the cost of gasoline and diesel exceeds $400 a gallon. A report by the Department of Defense's (DoD) National Security Space Office in 2007 recommended that the United States "begin a coordinated national program" to develop space-based solar power.

## AT: SBSP causes warming

### No it doesn’t- SBSP is net positive for solving warming- no heat trapping

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

The final global effect is not obvious, but also important. While it may seem intuitively obvious that SBSP introduces heat into the biosphere by beaming more energy in, the net effect is quite the opposite. All energy put into the electrical grid will eventually be spent as heat, but the methods of generating electricity are of significant impact for determining which approach produces the least total global warming effect. Fossil fuel burning emits large amounts of waste heat and greenhouse gases, while terrestrial solar and wind power also emit significant amounts of waste heat via inefficient conversion. Likewise, SBSP also has solar conversion inefficiencies that produce waste heat, but the key difference is that the most of this waste heat creation occurs outside the biosphere to be radiated into space. The losses in the atmosphere are very small, on the order of a couple percent for the wavelengths considered. Because SBSP is not a greenhouse gas emitter (with the exception of initial manufacturing and launch fuel emissions), it does not contribute to the trapping action and retention of heat in the biosphere.

### Aff solves the link – prefer comparative evidence

IAA, ‘11- International Academy of Astronautics [4-2011, “The First International Assessment of Space Solar Power: Opportunities, Issues and Potential Pathways Forward,” Green Energy From Space Solar Power, http://iaaweb.org/iaa/Scientific%20Activity/Study%20Groups/SG%20Commission%203/sg311/sg311finalreport.pdf]

If the SPS concept can be developed successfully, solar power satellites would provide an extremely “green” sustainable energy alternative for the future. A preliminary analysis was performed to determine the expected heating that might be expected due to a solar power satellite beaming energy to Earth that would otherwise have passed without inception in nearby space. \*\*\*\*\*\*\* From this analysis, it appears that a single SPS that delivered power of about 1.5 GW would add less than 0.000001 °C to Earth’s average temperature. Similarly, it appears that several thousand SPS with a total delivered power of about 15,000 GW (equivalent to the total global consumption of power circa 2005-2010) would result in less than 0.006 °C increase to Earth’s temperature – an **extremely tiny amount** compared to the aggregate thermal effects of similar power production from fossil fuels

## AT: too late to solve/warming inevitable

### Not inevitable – significant cuts solve

Somerville, ‘11 – Professor of Oceanography at UC San Diego [Richard, Coordinating Lead Author in Working Group I for the 2007 Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 3-8-2011, “CLIMATE SCIENCE AND EPA'S GREENHOUSE GAS REGULATIONS,” CQ Congressional Testimony, Lexis]

Thus, atmospheric CO2 concentrations are already at levels predicted to lead to global warming of between 2.0 and 2.4C. The conclusion from both the IPCC and subsequent analyses is blunt and stark - **immediate and dramatic emission reductions** of all greenhouse gases are urgently needed if the 2 deg C (or 3.6 deg F) limit is to be respected. This scientific conclusion illustrates a key point, which is that it will be governments that will decide, by actions or inactions, what level of climate change they regard as tolerable. This choice by governments may be affected by risk tolerance, priorities, economics, and other considerations, but in the end it is a choice that humanity as a whole, acting through national governments, will make. Science and scientists will not and should not make that choice. After governments have set a tolerable limit of climate change, however, climate science can then provide valuable information about what steps will be required to keep climate change within that limit.

### Not inevitable – even if temporarily over the tipping point, can be brought back down

Dyer, ‘9 – PhD in ME History [Gwynne, MA in Military History and PhD in Middle Eastern History former @ Senior Lecturer in War Studies at the Royal Military Academy Sandhurst, Climate Wars]

There is no need to despair. The slow-feedback effects take a long time to work their way through the climate system, and if we could manage to get the carbon dioxide concentration back down to a safe level before they have run their course, they might be stopped in their tracks. As Hansen et al. put it in their paper: A point of no return can be avoided, even if the tipping level [which puts us on course for an ice-free world] is temporarily exceeded. Ocean and ice-sheet inertia permit overshoot, provided the [concentration of carbon dioxide] is returned below the tipping level before initiating irre­versible dynamic change .... However, if overshoot is in place for centuries, the thermal perturbation will so pen­etrate the ocean that recovery without dramatic effects, such as ice-sheet disintegration, becomes unlikely. The real, long-term target is 350 parts per million or lower, if we want the Holocene to last into the indefinite future, but for the remainder of this book I am going to revert to the 450 parts per million ceiling that has become common currency among most of those who are involved in climate change issues. If we manage to stop the rise in the carbon dioxide concentration at or not far beyond that figure, then we must immediately begin the equally urgent and arduous task of getting it back down to a much lower level that is safe for the long term, but one step at a time will have to suffice. I suspect that few now alive will see the day when we seriously start work on bringing the concen­tration back down to 350, so let us focus here on how to stop it rising past 450.

### We can still alter the warming trajectory – SBSP a good method

Glaser 94 (Peter E, The Journal of Social, Political, and Economic Studies, A global perspective on renewable and solar energy, pdf, proquest, JG)

These forces will result in vastly enhanced demands for energy capable of closing the economic gap between developed and developing countries, as well as improvements in health, a reduction in the destruction of forests, increased availability of food and measures to ensure the safety of drinking water. To achieve these goals, increased use should be made of energy-efficient technologies by both industry and consumers. It will also be necessary to develop and apply advanced technologies utilizing renewable energy sources from Earth and from solar energy conversion systems in space. The objective must be to engage in successful global development, avoid investments in an infrastructure that will be economically and environmentally obsolete, and to ensure that humans, instead of consuming their own environment, will keep the Earth habitable for millennia. To achieve this challenging objective, existing as well as new and emerging technologies based on the use of wireless power transmission make it possible to access and utilize large-scale, renewable energy sources such as wind, hydro, photovoltaic, solar thermal, geothermal and ocean thermal energy conversion at undeveloped or underutilized sites available on several of the Earth's continents, and also the inexhaustible energy of the sun in space for use on Earth. Wireless Power Transmission… … Now is the time to engage in coordinated projects to develop technologies to meet the achievable objectives of global space endeavors, and to recognize the constructive and catalytic role that solar energy available in space and on Earth can play in sustaining future development. Strategic planning by the public and private sectors in several countries is underway now to ensure that space power will be able to make an increasingly important contribution to meet global energy demands. The challenge is not only to arrive at an unbiased assessment of viable options that can meet energy requirements at various stages of human development, but also to recognize that there may be only a limited time left, measured in a few decades, to open up the space frontier so that the contribution of space resources can be demonstrated before humanity is overwhelmed by the multitude of challenges that have to be faced and met. The question is no longer whether humanity will effectively use space resources but who will be in the vanguard to safeguard the Earth's ecology, and the evolution of life on this planet. **There still is the opportunity to press forward with adequate resources, and carefully crafted plans to ensure that the Earth will remain a hospitable planet for humanity and all other forms of life.**

## \*\*\*Top Level Nuts and Bolts\*\*\*

## Warming is Fast

### The rate of warming is fast.

Canberra Times, ‘9 – [8/4/2009, The Canberra Times, “We’re still accelerating on the carbon dioxide road,” Lexis, DS]

Tim Curtin (Letters, July 31) quotes, as percentages, the rates of growth of annual net increases in the atmospheric concentration of carbon dioxide for the five decades 1960-2009. Now, I'm no mathematician, but surely these numbers represent the third derivative in whatever function it is which relates concentration with time? The growth of annual increase would be the second derivative (acceleration) and the annual increase would be the first derivative (speed). The numbers show that we are still accelerating down the road of carbon dioxide concentration albeit with less pressure on the pedal. We started the journey at the 280ppm milepost around 1750 and have recently past the 380ppm mark travelling at about 1.8ppm/year. In the back seat, Economic kid is yelling to go faster, Industrial kid is looking out for speed cops and Political kid says she's going to be sick. Meanwhile Scientific kid is rummaging in the glove compartment looking for the map; he's pretty sure the road runs out at the 450ppm milepost and very sure that the brakes should be applied now. As a passenger, trapped in the boot, I'm not happy. Nick Ware, O'Connor Evidence provided Aert Driessen (Letters, August 1) asks for evidence that global warming is accelerating. Firstly, what does the word "climate" mean? It means the long-term average of the weather, generally defined to be over periods of 30 years or more. Temperatures have a lot of short term variability: they bounce up and down from year to year. The important aspect is the long term trend. Taking the most commonly cited data for global temperature, from the Hadley Meteorological Centre in the UK, the picture is clear. Annual averages, dominated by short term variability (the "weather"), bounce up and down all the time, but 30-year averages, showing the underlying trend (the "climate"), have been rising since early in the 20th century, and especially since about 1975. Specifically, the 30-year average shows a warming rate of 0.88 degrees per century in 1989, a rate of 1.10 degrees per century in 1999, and a warming rate of 1.52 degrees per century in 2009. Looks like acceleration to me. Matt Andrews, Aranda Check for yourself Mark Diesendorf quite correctly states that "global climate change is accelerating". This is queried by Aert Driessen, who asks for evidence. Driessen does add that "nothing in science is certain" a message which his fellow denialists might take on board. However, the climate research bodies around the world (Hadley, Scripps, NOAA, NASA, CSIRO, the universities) and the bulk of the world's climate scientists, including noted Australian researchers such as Professor Will Steffen, Dr Graeme Pearman, Dr Barry Brook, Professor Matt England, Dr Mike Raupach, to name just a few, endorse the warnings of the IPCC: that human activities have added to natural atmospheric CO2, and that this has changed the world's climate in the past century. The recent Synthesis Report of June 2009, see http://lyceum.anu.edu.au/ wp-content/blogs/3/uploads/ /Synthesis%20Report%20Web.pdf emphasises that climate change is "tracking the worst case scenarios". All these scientists could possibly be wrong. As Driessen says, nothing in science is certain. All the data from satellites, balloons, ocean temperatures, ice-cores and so on could improbably have been misinterpreted. But the scientific evidence is mounting every day that global climate change is real, is happening now, and will have massive consequences. Check the science for yourself.

## Warming = Existential Threat

### Warming’s an existential threat – inactive policymaking’s a betrayal of humanity

Krugman, ‘9 – Nobel Prize-winning Economics professor at Princeton [Paul, 6/29/2009, New York Times, “Betraying the Planet,” Lexis, DS]

So the House passed the Waxman-Markey climate-change bill. In political terms, it was a remarkable achievement. But 212 representatives voted no. A handful of these no votes came from representatives who considered the bill too weak, but most rejected the bill because they rejected the whole notion that we have to do something about greenhouse gases. And as I watched the deniers make their arguments, I couldn't help thinking that I was watching a form of treason -- treason against the planet. To fully appreciate the irresponsibility and immorality of climate-change denial, you need to know about the grim turn taken by the latest climate research. The fact is that the planet is changing faster than even pessimists expected: ice caps are shrinking, arid zones spreading, at a terrifying rate. And according to a number of recent studies, catastrophe -- a rise in temperature so large as to be almost unthinkable -- can no longer be considered a mere possibility. It is, instead, the most likely outcome if we continue along our present course. Thus researchers at M.I.T., who were previously predicting a temperature rise of a little more than 4 degrees by the end of this century, are now predicting a rise of more than 9 degrees. Why? Global greenhouse gas emissions are rising faster than expected; some mitigating factors, like absorption of carbon dioxide by the oceans, are turning out to be weaker than hoped; and there's growing evidence that climate change is self-reinforcing -- that, for example, rising temperatures will cause some arctic tundra to defrost, releasing even more carbon dioxide into the atmosphere. Temperature increases on the scale predicted by the M.I.T. researchers and others would create huge disruptions in our lives and our economy. As a recent authoritative U.S. government report points out, by the end of this century New Hampshire may well have the climate of North Carolina today, Illinois may have the climate of East Texas, and across the country extreme, deadly heat waves -- the kind that traditionally occur only once in a generation -- may become annual or biannual events. In other words, we're facing a clear and present danger to our way of life, perhaps even to civilization itself. How can anyone justify failing to act? Well, sometimes even the most authoritative analyses get things wrong. And if dissenting opinion-makers and politicians based their dissent on hard work and hard thinking -- if they had carefully studied the issue, consulted with experts and concluded that the overwhelming scientific consensus was misguided -- they could at least claim to be acting responsibly. But if you watched the debate on Friday, you didn't see people who've thought hard about a crucial issue, and are trying to do the right thing. What you saw, instead, were people who show no sign of being interested in the truth. They don't like the political and policy implications of climate change, so they've decided not to believe in it -- and they'll grab any argument, no matter how disreputable, that feeds their denial. Indeed, if there was a defining moment in Friday's debate, it was the declaration by Representative Paul Broun of Georgia that climate change is nothing but a ''hoax'' that has been ''perpetrated out of the scientific community.'' I'd call this a crazy conspiracy theory, but doing so would actually be unfair to crazy conspiracy theorists. After all, to believe that global warming is a hoax you have to believe in a vast cabal consisting of thousands of scientists -- a cabal so powerful that it has managed to create false records on everything from global temperatures to Arctic sea ice. Yet Mr. Broun's declaration was met with applause. Given this contempt for hard science, I'm almost reluctant to mention the deniers' dishonesty on matters economic. But in addition to rejecting climate science, the opponents of the climate bill made a point of misrepresenting the results of studies of the bill's economic impact, which all suggest that the cost will be relatively low. Still, is it fair to call climate denial a form of treason? Isn't it politics as usual? Yes, it is -- and that's why it's unforgivable. Do you remember the days when Bush administration officials claimed that terrorism posed an ''existential threat'' to America, a threat in whose face normal rules no longer applied? That was hyperbole -- but the existential threat from climate change is all too real. Yet the deniers are choosing, willfully, to ignore that threat, placing future generations of Americans in grave danger, simply because it's in their political interest to pretend that there's nothing to worry about. If that's not betrayal, I don't know what is.

## Our EV most qualified

### Only our evidence is qualified

NYT 11 (The New York Times, On Experts and Global Warming, The Stone is featuring occasional posts by Gary Gutting, a professor of philosophy at the University of Notre Dame, that apply critical thinking to information and events that have appeared in the news, http://opinionator.blogs.nytimes.com/2011/07/12/on-experts-and-global-warming/, JG)

Experts have always posed a problem for democracies. Plato scorned democracy, rating it the worst form of government short of tyranny, largely because it gave power to the ignorant many rather than to knowledgeable experts (philosophers, as he saw it). But, if, as we insist, the people must ultimately decide, the question remains: How can we, nonexperts, take account of expert opinion when it is relevant to decisions about public policy? **Once we accept the expert authority of climate science, we have no basis for supporting the minority position**. To answer this question, we need to reflect on the logic of appeals to the authority of experts. First of all, such appeals require a decision about who the experts on a given topic are. Until there is agreement about this, expert opinion can have no persuasive role in our discussions. Another requirement is that there be a consensus among the experts about points relevant to our discussion. Precisely because we are not experts, we are in no position to adjudicate disputes among those who are. Finally, given a consensus on a claim among recognized experts, **we nonexperts have no basis for rejecting the truth of the claim.** These requirements may seem trivially obvious, but they have serious consequences. Consider, for example, current discussions about climate change, specifically about whether there is long-term global warming caused primarily by human activities (anthropogenic global warming or A.G.W.). All creditable parties to this debate recognize a group of experts designated as “climate scientists,” whom they cite in either support or opposition to their claims about global warming. In contrast to enterprises such as astrology or homeopathy, there is no serious objection to the very project of climate science. The only questions are about the conclusions this project supports about global warming. There is, moreover, no denying that there is a strong consensus among climate scientists on the existence of A.G.W. — in their view, human activities are warming the planet. There are climate scientists who doubt or deny this claim, but even they show a clear sense of opposing a view that is dominant in their discipline. Nonexpert opponents of A.G.W. usually base their case on various criticisms that a small minority of climate scientists have raised against the consensus view**. But nonexperts are in no position to argue against the consensus of scientific experts.** As long as they accept the expert authority of the discipline of climate science, they have no basis for supporting the minority position. Critics within the community of climate scientists may have a cogent case against A.G.W., but, given the overall consensus of that community, we nonexperts have no basis for concluding that this is so. It does no good to say that we find the consensus conclusions poorly supported. **Since we are not experts on the subject, our judgment has no standing.** It follows that a nonexpert who wants to reject A.G.W. can do so only by arguing that climate science lacks the scientific status needed be taken seriously in our debates about public policy. There may well be areas of inquiry (e.g., various sub-disciplines of the social sciences) open to this sort of critique. But there does not seem to be a promising case against the scientific authority of climate science. As noted, opponents of the consensus on global warming themselves argue from results of the discipline, and there is no reason to think that they would have had any problem accepting a consensus of climate scientists against global warming, had this emerged. Some nonexpert opponents of global warming have made much of a number of e-mails written and circulated among a handful of climate scientists that they see as evidence of bias toward global warming. But unless this group is willing to argue from this small (and questionable) sample to the general unreliability of climate science as a discipline, they have no alternative but to accept the consensus view of climate scientists that these e-mails do not undermine the core result of global warming. Related More From The Stone Read previous contributions to this series. Go to All Posts » I am not arguing the absolute authority of scientific conclusions in democratic debates. It is not a matter of replacing Plato’s philosopher-kings with scientist-kings in our polis. We the people still need to decide (perhaps through our elected representatives) which groups we accept as having cognitive authority in our policy deliberations. Nor am I denying that there may be a logical gap between established scientific results and specific policy decisions. The fact that there is significant global warming due to human activity does not of itself imply any particular response to this fact. There remain pressing questions, for example, about the likely long-term effects of various plans for limiting CO2 emissions, the more immediate economic effects of such plans, and, especially, the proper balance between actual present sacrifices and probable long-term gains. Here we still require the input of experts, but we must also make fundamental value judgments, a task that, pace Plato, we cannot turn over to experts. The essential point, however, is that once we have accepted the authority of a particular scientific discipline, we cannot consistently reject its conclusions. To adapt Schopenhauer’s famous remark about causality, science is not a taxi-cab that we can get in and out of whenever we like. Once we board the train of climate science, there is no alternative to taking it wherever it may go.

### Warming real- prefer our indisputable science over the mere “skeptics” Reynolds 10 (Lewis, energy consultant and author of “America the Prisoner: The Implications of Foreign Oil Addiction and a Realistic Plan to End It”, “Seven Dangerous Side Effects of the U.S. Dependency on Foreign Oil”, 8-8-10, http://peakoil.com/production/seven-dangerous-side-effects-of-the-u-s-dependency-on-foreign-oil/) OP

Whether you believe in global warming or not, one thing is indisputable: Global atmospheric concentrations of carbon dioxide have been increasing for over a century, and they will continue to increase as more fossil fuels are burned. Whether you choose to ignore well-established science that carbon dioxide is a greenhouse gas and that the greenhouse effect has the potential to affect global temperatures is your choice. I prefer to find alternatives to fossil fuels before the effect of global warming is so pronounced that even the skeptics start to believe it. The potential impacts are far too numerous and uncertain.

## \*\*\*Warming Impacts\*\*\*

## Laundry List Impact

**Global Warming Sucks – Laundry List**

**Romm 10** (Jon, Editor of Climate Progress, An introduction to global warming impacts: Hell and High Water,  http://thinkprogress.org/romm/2009/03/22/203850/an-introduction-to-global-warming-impacts-hell-and-high-water/, JG)

In this post, I will summarize what the recent scientific literature says are the key impacts we face in the second half of the century if we stay anywhere near our current emissions path. I will focus primarily on: Staggeringly high temperature rise, especially over land — some 10°F over much of the United States Sea level rise of 3 to 7 feet, rising some 6 to 12 inches (or more) each decade thereafter Dust Bowls over the U.S. SW and many other heavily populated regions around the globe Massive species loss on land and sea — 50% or more of all life Unexpected impacts — the fearsome “unknown unknowns” More severe hurricanes — especially in the Gulf Equally tragic, a 2009 NOAA-led study found the worst impacts would be “largely irreversible for 1000 years.” The single biggest failure of messaging by climate scientists (until very recently) has been the failure to explain to the public, opinion makers, and the media that business-as-usual warming results in impacts that are beyond catastrophic. For these impacts, terms like “global warming” and “climate change” are essentially euphemisms. That is why I prefer the term “Hell and High Water.” Business-as-usual typically means continuing at recent growth rates of carbon dioxide emissions, which we now know would take us to atmospheric concentrations of carbon dioxide greater than 1000 ppm (see U.S. media largely ignores latest warning from climate scientists: “Recent observations confirm … the worst-case IPCC scenario trajectories (or even worse) are being realised” — 1000 ppm). We are at about 8.5 billion metric tons of carbon a year (GtC/yr) and, until the recent global economic recession, were rising about 3% per year. What is less well understood is that even a very strong mitigation effort that kept carbon emissions this century to 11 GtC a year on average would still probably take us to 1000 ppm — a little noted conclusion of the 2007 Intergovernmental Panel on Climate Change (IPCC) report (see “Nature publishes my climate analysis and solution“). The scientific community has spent little time modeling the impacts of a tripling (~830 ppm) or quadrupling (~1100 ppm) carbon dioxide concentrations from preindustrial levels. In part, I think, that’s because they never believed humanity would be so stupid as to ignore the warnings and simply continue on its self-destructive path. In part, they lowballed the difficult-to-model amplifying feedbacks in the carbon cycle. So I pieced together those impacts from available studies and from discussions with leading climate scientists for my book, Hell and High Water. But now as climate scientists have sobered up to their painful role as modern-day Cassandra’s, the scientific literature on what we face is much richer. Let me review it here.

## Turns Hegemony

### Warming kills military ability – destroys bases and increases global conflict

Wald et al 9 (General Charles F Wald, Former Deputy Commander, Headquarters U.S. European Command, General Gordon R. Sullivan, Former Chief of Staff, U.S. Army, and Former Chairman of the CNA MAB, Vice Admiral Richard H. Truly, Former NASA Administrator, Shuttle Astronaut and the ﬁrst Commander of the Naval Space Command, “Powering America’s Defense,” May 2009. <http://www.cna.org/sites/default/files/Powering%20Americas%20Defense.pdf>)

Here, we reference some of the many ways climate change will adversely affect our military’s ability to carry out its already challenging missions: A changing Arctic forces a change in strategy. As the Arctic Ocean has become progressively more accessible, several nations are responding by posturing for resource claims, increasing military activity, expanding commercial ventures, and elevating the volume of international dialogue. Due to the melting ice, the U.S. is already reconsidering its Arctic strategy [73]. The change in strategy will lead to a change in military intelligence, planning, and operations. The Arctic stakes are high: 22 percent of the world’s undiscovered energy reserves are projected to be in the region (including 13 percent of the world’s petroleum and 30 percent of natural gas [74]). There are also valuable ﬁsh stocks and mineral resources. The relatively small number of heavy ice breakers in operation by Arctic nations suggests that no country currently has the ability to easily operate in the region for purposes of maritime security, humanitarian assistance, disaster response or forward presence. Damage to and loss of strategic bases and critical infrastructure. As sea level rises, storm waves and storm surges become much more problematic. Riding in at a higher base level, they are much more likely to overﬂow coastal barriers and cause severe damage. Recent studies project that, by the end of the century, sea levels could rise by nearly 1 meter [75, 76]. A 1-meter rise in sea level would have dramatic consequences for U.S. installations across the globe, including the loss of one of our most important forward operating bases: Diego Garcia in the Indian Ocean. At minimum, this amount of sea level rise would render it fully useless, without a single shot ﬁred. Other signiﬁcant military installations, such as Naval Station Norfolk, are at serious risk from rising seas. A 1- meter rise in sea level would also render useless numerous commercial and industrial installations that are important to ongoing military operations. If operations continue to be fuel-intensive, supply interruptions caused by loss of infrastructure could pose a serious threat to our troops. Storm intensity aﬀects readiness and capabilities. The projected increase in storm intensity can affect our ability to quickly deploy troops and materiel to distant theaters. Increased conﬂict stretches American military. In other sections, we have noted the likelihood of increased global conﬂicts, which in turn increases the likelihood that American military forces will be engaging in multiple theaters simultaneously. In addition, at the very same time, there may be increased demands for American-led humanitarian engagements in response to natural disasters exacerbated or caused by climate change. These factors will require substantial changes in military strategies and operations; these factors will add to the already signiﬁcant challenges facing current and future military leaders. They are part of a conﬂuence of circumstances that will reshape the context for action. The destabilizing nature of increasingly scarce energy resources, the impacts of rising energy demand, and the impacts of climate change all are likely to increasingly drive military missions in this century.

### Warming causes instability – water and arable land

Nagl and Parthemore in 10 (John, president of the Center for New American Security, and Christine, fellow at the Center for New American Security, “Fueling the Future Force,” *Center for the New American Security*, September 2010. <http://www.cnas.org/files/documents/publications/CNAS\_Fueling%20the%20Future%20Force\_NaglParthemore.pdf>)

In addition to the security and financial costs, petroleum dependence creates environmental costs that are causing increasing concern among security analysts. Emissions from fossil fuel use contribute to changes in the global climate, which risk altering geopolitical relations, destabilizing regions of high strategic importance to the United States, increasing erosion and storm surges at coastal installations, and altering disease patterns.16 Melting summer ice in the Arctic is an early example; its geopolitical importance has risen sharply in the past five years as Arctic countries (and their potential shipping and natural resource customers) prepare to exploit newly navigable waterways and seabed resource deposits. Federal leaders from both major political parties, DOD’s civilian and military leaders, and security analysts of all stripes regularly reiterate concerns over the national security implications of the changing climate caused by high-carbon fuel consumption.17 Other environmental costs of fuel production can include heavy water use and diverting arable land to fuel production, both of which can trigger negative side effects if not managed properly. Factors such as greenhouse gas emissions (including from burning high-carbon fuels and from land use change) and the effects of fuel production on food prices should therefore constrain DOD’s energy investments in high-carbon fossil fuels or first-generation biofuels derived from food crops.

## 2AC Resource Wars

### Climate change causes resource wars – empirics prove

Yung, ‘7 – [Chester, South China Morning Post, “Climate change will spur conflict, study of wars warns,” Lexis, DS]

Climate change and the resulting shortages of water and food could spur armed conflict, the authors of a new study warn. This is based on the conclusion of a survey that looked at world history over the last millennium and found that warfare and population collapse were fuelled by climate change. "Climate change may have played a more important role on human civilisation than has so far been suggested," said David Zhang of Hong Kong University's geography department and the lead author of the research. The findings will be published in the journal Proceedings of National Academy of Sciences of the United States of America on December 4. "The level of livelihood resources shrank in some periods due to climate change in the past," Dr Zhang said. "It could be the root cause of human miseries." He said temperature fluctuations impeded agricultural production, which reduced food supplies. The shortages would then trigger warfare and famine and result in population collapse. The authors reviewed 8,073 wars and the population trend between AD1400 and 1900 and found a correlation between outbreaks of war and records of temperature change. They found cold climate induced more wars around the world, with the worldwide war ratio in a cold climate almost double that of a mild one. A similar phenomenon was also observed in Asia and Europe. "More than 80 per cent of countries and areas around the world had higher war ratios in a cold climate," Dr Zhang said. Although he didn't analyse any warming periods, he both could have disastrous effects. "If global warming continues, we are afraid that the associated shortages of fresh water, arable land and food may trigger more armed conflict or even general crisis in the world." Dr Zhang's team released a report in July that suggested the same case in China. The authors reviewed 899 wars fought in China between AD1000 and 1911 and found a correlation between the frequency of warfare and records of temperature changes. Almost all peaks of warfare and dynastic changes coincided with a cold phase. In April, US military leaders warned of the national security threat posed by global warming, predicting wars over water and higher rates of famine and disease.

## 2AC Protectionism

### Climate change causes trade wars – disputes over negotiations

Morales and Singh, ‘9 – Reporters at Bloomberg [Alex and Gaurav, 4/3/2009, Bloomberg, “Climate-Change Policies Risk Protectionism – China, India Say,” http://www.bloomberg.com/apps/news?pid=newsarchive&sid=aTU2A9VhkMDs, DS]

Global-warming policies being considered by the U.S. and Japan risk provoking trade barriers, Chinese and Indian officials said in interviews. Protectionism, rejected yesterday by world leaders meeting in London, has been discussed in the U.S. Congress and in France as a response to the competitive advantage of developing nations like China that refuse to regulate greenhouse gases. Potential import fees could prompt trade retaliation, said Su Wei, China’s lead negotiator for a new global climate-protection treaty. “If there’s going to be a border tax imposed, that would very much have the danger of triggering a trade war,” Su said in a telephone interview from Beijing. “That’s not something that we would be happy to see,” he said before the start of United Nations-led treaty talks in Bonn running to April 8. China and the U.S., the biggest greenhouse-gas producers, are negotiating a new agreement to stem greenhouse gases with 190 countries. India and China reject emissions limits for developing nations, saying rich nations must act first. “We should be very careful that climate change doesn’t become a peg on which we start hanging protectionist tendencies,” Shyam Saran, India’s special envoy on climate change, said in an interview in New Delhi two days ago. President Barack Obama has said he’ll impose limits on domestic greenhouse gases. Because reducing the gases puts a cost on companies that rivals in unregulated countries don’t face, U.S. Energy Secretary Steven Chu said in March 17 testimony to the House science committee “we should look at considering perhaps duties that would offset that cost.” Group of 20 The U.S. imported $337.8 billion of Chinese goods in 2008, according the U.S. Department of Commerce. India exported about $21 billion to the U.S. World leaders from the Group of 20 nations yesterday reiterated their rejection of protectionism, failing to take a tougher stance on proliferating trade barriers that threaten to deepen the global financial crisis. “Increased protectionism is a sure ticket to a deeper economic downturn,” said Rajeev Malik, a regional economist at Macquarie Group Ltd. in Singapore. Democratic lawmakers in the U.S. this week took steps to head off potential trade disputes. They proposed domestic climate legislation that would give rebates to energy-intensive steel and cement industries competing with cheaper imports. Even so, the legislation would let the president impose border fees on imports if the rebates aren’t enough to keep U.S. companies competitive with foreign rivals. ‘Road to Protectionism’ Japan proposed an alternative to national caps that would apply to all countries. The most polluting industries would be given targets that would be divided among their companies. That approach hasn’t won favor among poorer countries such as India that reject any form of legally binding international target. “It sounds very good to say we can’t agree on national level targets, so let’s agree on sectoral targets,” Saran said. “This could become the road to protectionism.” Suggestions in the U.S. and France to tax imports won’t help coax developing nations into signing up to a new treaty, said Simon Retallack, head of climate at the Institute for Public Policy Research in London. French President Nicolas Sarkozy on March 24 said a carbon tax on imports may be needed to help European nations recover from the economic slump. “Developing countries are concerned about those sorts of proposals, and they have good reason,” Retallack said today in a telephone interview. “It won’t be terribly helpful in persuading developing countries to take action.”

## 2AC US Russia War

### Warming causes US Russia war – Arctic melting leads to mining conflicts

Macalester, 7/6 – Reporter at the Guardian [Terry, The Guardian, “US and Russia stir up political tensions over Arctic,” http://www.guardian.co.uk/world/2011/jul/06/us-russia-political-tensions-arctic, DS]

The seventh ministerial meeting of the Arctic Council in May looked set be a mundane affair, with its focus on signing a new search-and-rescue agreement and handover of the chairmanship to Sweden. But the atmosphere in Nuuk, the capital of Greenland, was electrified by the first visit to such a forum by the United States, courtesy of the secretary of state, Hillary Clinton, secretary of the interior Ken Salazar, and a host of other heavy-hitters. The message was clear: the US is putting itself at the centre of the debate about the future of the far north at a time when a new oil and mineral "cold rush" is under way as global warming makes extraction more easy. And being the US, the soft diplomacy was backed up with a bit of symbolic hardware. A few weeks earlier two nuclear-powered submarines were sent to patrol 150 miles north of Prudhoe Bay, Alaska. Meanwhile Russia – also on the eight-nation council – was happy to push off the agenda any idea that countries such as China could gain observer status. The US navy move comes as Russia is said to have increased missile testing in the region and Norway has moved its main military base to the far north. Meanwhile China has started to woo countries such as Greenland, which are rich in rare earth minerals needed for mobile phones and other hi-tech equipment. The competing commercial interests in the Arctic are complicated by the lack of a comprehensive agreement on who owns what. Many countries are in the process of submitting competing land claims to the UN as part of its Law of the Sea Convention – a treaty as yet unsigned by the US. Canada and others were also disturbed when Artur Chilingarov, a veteran Russian polar explorer, placed a flag on the Arctic seabed in 2007. He told reporters his mission was to show the Arctic was Russian, adding: "We must prove the north pole is an extension of the Russian landmass." Canada took exception to the Russian move, seeing it as provocative, but Moscow dismissed the furore, insisting it was a theatrical gesture by a scientist hired by private companies to make the descent. But it is telling that the following year Chilingarov – also a member of the state parliament – was awarded a new title, Hero of the Russian Federation. Concerns about a new cold war – if not just a cold rush – have led academics such as Rob Huebert, a professor of political science at the University of Calgary, to warn in a recent paper prepared for the Canadian Defence and Foreign Affairs Institute that "an arms race may be beginning". Huebert says he has heard the Russian prime minister, Vladimir Putin, talking of the need to establish a "zone of peace" in the Arctic but sees contrary actions as well. "Not withstanding the public statements of peace and co-operation in the Arctic issued by the Arctic states, tThe strategic value of the region is growing. As this value grows, each state will attach a greater value to their own national interests in the region. The Arctic states may be talking co-operation, but they are preparing for conflict." Meanwhile Admiral James Stavridis, Nato's supreme allied commander in Europe, in a foreword to a recent Whitehall Paper published by the Royal United Services Institute for Defence and Security Studies in London, argued: "For now, the disputes in the north have been dealt with peacefully, but climate change could alter the equilibrium over the coming years in the race of temptation for exploitation of more readily accessible natural resources." Stavridis believes military assets, such as coastguards, have an important role to play with international co-ordination in the area – but mainly for specialist assistance around commercial and other interests. He added: "The cascading interests and broad implications stemming from the effects of climate change should cause today's global leaders to take stock, and unify their efforts to ensure the Arctic remains a zone of co-operation – rather than proceed down the icy slope towards a zone of competition, or worse a zone of conflict." Huebert points out that as well as opening a new ultra-hi-tech operations centre inside a mountain at Reitan, in the far north of Norway, Oslo is also spending unprecedented money on new military hardware, not least five top-of-the-range frigates. The class of vessel is called Fridtjof Nansen, after the famous polar explorer, which perhaps indicates where the navy plans to deploy them. Meanwhile Canada's then foreign minister, Lawrence Cannon, voiced confidence his nation would win the territory. "We will exercise sovereignty in the Arctic," he told his Russian counterpart in talks in Moscow. But optimists say the fears are exaggerated and point to positive developments, not least Norway and Russia agreeing a mutually acceptable boundary line dividing up the Barents Sea. A partnership between Russia, Norway, the US and Britain has been quietly and successfully working away at decommissioning nuclear submarines and tackling other radioactive waste problems in the Kola Peninsula and Arkhangelsk regions. One former foreign minister told the Guardian: "We want to avoid complacency but all this alarmist talk of meltdown should be shunned. The Arctic is quite pacific. It is not a place of turmoil but an area of low tension." However, Paul Berkman, director of the Arctic Ocean geopolitics programme at the Scott Polar Research Institute, believes the deluge of books and features highlighting potential problems cannot be dismissed as melodrama. "You have to ask why are these alarming and alarmist headlines being written and it may be there is unfinished business from the Cold War." Whether hype or not, he argues that it is necessary to both promote cooperation and prevent conflict. "There is no room for complacency and while tensions are low there is opportunity to address the risks of political, economic and cultural instabilities that are inherent consequences of the environmental state-change in the Arctic Ocean." Inuit leaders are already concerned that the talk of industrialisation and mineral wealth in the Arctic will increase tension. Aqqaluk Lynge, former chairman of the indigenous peoples' forum, the Inuit Circumpolar Council, described himself as "nervous" about current developments. "There is a military build-up and an increase in megaphone diplomacy … We do not want a return to the cold war," he said.

## 2AC Navy

### Warming kills the navy – stretches capabilities and destroys crucial basing

Broder 3/10 – Reporter at the NYT [John, 3/10/2011, New York Times, “Study Says Navy Must Adapt to Climate Change,” http://green.blogs.nytimes.com/2011/03/10/study-says-navy-must-adapt-to-climate-change/, DS]

A report commissioned by the United States Navy concludes that climate change will pose profound challenges for the sea service in coming decades, including a need to secure Arctic shipping lanes, prepare for more frequent humanitarian missions and protect coastal installations from rising seas. The 15-month study, conducted by the National Research Council, accepts the scientific consensus that the climate is changing and that the effects are being felt now. Of particular consequence to American naval forces – the Navy, Marine Corps and Coast Guard – are the melting polar ice cap, rising seas and increasingly frequent severe storms and droughts that could lead to famine, mass migration and political instability. The report from research council, an arm of the National Academy of Sciences, builds on previous work by the Pentagon, State Department, the intelligence community and independent research groups that have concluded that climate change is a “threat multiplier” that adds new and unpredictable dangers to global physical and political stability. The primary authors are Frank L. Bowman, a retired Navy admiral who led the service’s nuclear propulsion unit, and Antonio J. Busalacchi, Jr., a climatologist and director of the Earth System Science Interdisciplinary Center at the University of Maryland, College Park. They were assisted by a large number of climate and oceanography experts as well as corporate planners and active-duty military officers. The group found that the precise impacts of climate change are impossible to predict, but that actions should be undertaken now to prepare for a range of outcomes. It also found that some impacts are already observable, including melting sea ice in the Arctic and rising sea levels, and require planning and action by naval forces. “Even the most moderate predicted trends in climate change will present new national security challenges for the U.S. Navy, Marine Corps and Coast Guard,” Mr. Bowman said. “Naval forces need to monitor more closely and start preparing now for projected challenges climate change will present in the future.” Summer sea ice is retreating at an estimated rate of 10 percent a decade, and Arctic Ocean sea lanes could be open as early as the summer of 2030, the report found. Shipping, oil and gas operations and other activities in the region will require an increased naval presence in the region, new equipment such as icebreakers and increased cold-weather training, the authors write. The report also concludes that the military should also be prepared for large-scale and frequent missions to help people displaced by major storms or drought. The Navy should consider beefing up its small complement of hospital ships, perhaps by contracting with private companies to provide extra capability in emergencies, it said. What is more, major naval installations along the coasts are vulnerable to rising seas and storm surges, and plans should be made to relocate some critical facilities inland, the report contends, estimating that $100 billion of Navy installations would be at risk of sea level rise of one meter or more. “Although the future degree and magnitude of climate change on regional scales is uncertain, it’s clear that the potential for environmental disasters is on the rise due to the changing nature of the hydrologic cycle and sea level,” Mr. Busalacchi said. “Naval forces must be prepared to provide more aid and disaster relief in the decades ahead.”

## 2AC Middle East War

### Warming leads to Middle East conflict –

Brown and Crawford, ‘9 – senior researcher and project manager at International Institute for Sustainable Development [Oli and Alec, IISD, “Rising Temperatures, Rising Tensions: Climate change and the risk of violent conflict in the Middle East,” http://www.iisd.org/publications/pub.aspx?pno=1130, DS]

Climate models are predicting a hotter, drier and less predictable climate in the Middle East—a region already considered the world's most water-scarce and where, in many places, demand for water already outstrips supply. For Lebanon, Syria, Jordan, Israel and the occupied Palestinian territory, climate change threatens to reduce the availability of scarce water resources, increase food insecurity, hinder economic growth and lead to large-scale population movements. This could hold serious implications for peace in the region. Rising Temperatures, Rising Tensions: Climate change and the risk of violent conflict in the Middle East is the latest IISD report on the links between climate change, peace and conflict. Drawn from extensive consultations and workshops throughout the region, augmented by desk research, the report makes three key points: The legacy of conflict in the countries of the Levant undermines the ability of countries and communities in the region to adapt to climate change. The history of hostility and mistrust in the region greatly complicates efforts to collaborate over shared resources, to invest in more efficient water and energy use, to share new ways to adapt to climate change and to pursue truly multilateral action on climate change. Ultimately, climate change presents an even more serious challenge than it would otherwise. The report shows that climate change itself poses real security concerns to the region. It may increase competition for scarce water resources, complicating peace agreements. It may intensify food insecurity, thereby raising the stakes for the return or retention of occupied land. It may hinder economic growth, worsening poverty and social instability. It could lead to destabilizing forced migration, increased tensions over refugee populations, the increased militarization of strategic natural resources and growing resentment and distrust of the West. Nevertheless, the report points out there is much that national governments and authorities, civil society and the international community can do address the challenge of climate change, and in so doing, address some of the threats it may pose to regional peace and security. They can promote a culture of conservation in the region, help communities and countries adapt to the impacts of climate change, work to reduce greenhouse gas emissions and foster greater cooperation on their shared resources.

## 2AC African War

### Warming causes Africa war – resource scarcity makes wars 50% more likely – our evidence is predictive

Black, ‘9 – environment correspondent at BBC News [Richard, BBC News, “Climate ‘is a major cause’ of conflict in Africa,” http://news.bbc.co.uk/2/hi/8375949.stm, DS]

Climate has been a major driver of armed conflict in Africa, research shows - and future warming is likely to increase the number of deaths from war. US researchers found that across the continent, conflict was about 50% more likely in unusually warm years. Writing in Proceedings of the National Academy of Sciences (PNAS), they suggest strife arises when the food supply is scarce in warm conditions. Climatic factors have been cited as a reason for several recent conflicts. One is the fighting in Darfur in Sudan that according to UN figures has killed 200,000 people and forced two million more from their homes. Previous research has shown an association between lack of rain and conflict, but this is thought to be the first clear evidence of a temperature link. The researchers used databases of temperatures across sub-Saharan Africa for the period between 1981 and 2002, and looked for correlations between above average warmth and civil conflict in the same country that left at least 1,000 people dead. Warm years increased the likelihood of conflict by about 50% - and food seems to be the reason why. "Studies show that crop yields in the region are really sensitive to small shifts in temperature, even of half a degree (Celsius) or so," research leader Marshall Burke, from the University of California at Berkeley, told BBC News. "If the sub-Saharan climate continues to warm and little is done to help its countries better adapt to high temperatures, the human costs are likely to be staggering." Conflicting outcomes If temperatures rise across the continent as computer models project, future conflicts are likely to become more common, researchers suggest. Their study shows an increase of about 50% over the next 20 years. When projections of social trends such as population increase and economic development were included in their model of a future Africa, temperature rise still emerged as a likely major cause of increasing armed conflict. "We were very surprised to find that when you put things like economic growth and better governance into the mix, the temperature effect remains strong," said Dr Burke. At next month's UN climate summit in Copenhagen, governments are due to debate how much money to put into helping African countries prepare for and adapt to impacts of climate change. "Our findings provide strong impetus to ramp up investments in African adaptation to climate change by such steps as developing crop varieties less sensitive to extreme heat and promoting insurance plans to help protect farmers from adverse effects of the hotter climate," said Dr Burke. Nana Poku, Professor of African Studies at the UK's Bradford University, suggested that it also pointed up the need to improve mechanisms for avoiding and resolving conflict in the continent. "I think it strengthens the argument for ensuring we compensate the developing world for climate change, especially Africa, and to begin looking at how we link environmental issues to governance," he said.

## 2AC Ocean Acidification

### Warming leads to ocean acidification – kills marine life and ecosystems

McKie 5/29 – science editor at The Observer [Robin, 5/29/2011, The Observer, “Ocean acidification is latest manifestation of global warming,” http://www.guardian.co.uk/environment/2011/may/29/global-warming-threat-to-oceans, DS]

The infernal origins of Vulcano Island are easy to pinpoint. Step off the hydrofoil from Sicily and the rotten-egg smell of hydrogen sulphide strikes you immediately. Beside the quay, there are piles of yellow sulphurous rocks and chunks of pumice; the beach is made of thick, black volcanic sand; while the huge caldera that dominates the bay emits a constant stream of smoke and steam. According to legend, this was the lair of the Roman god of fire, Vulcan, who gave his name to the island and subsequently to all other volcanoes. An early eruption here also provided history with one of the first recorded descriptions of a volcano in action. But Vulcano's importance today has nothing to do with the rock and lava it has spewed out for millennia. It is the volcano's output of invisible carbon dioxide – about 10 tonnes a day – that now interests scientists. They have found that the gas is bubbling through underground vents and is making the island's coastal waters more and more acidic. The consequences for sea life are grim with dozens of species having been eliminated. That discovery is highly revealing, and worrying, because Vulcano's afflictions are being repeated today on a global scale, in every ocean on the planet – not from volcanic sources but from the industrial plants, power stations, cars and planes that are pumping out growing amounts of carbon dioxide and which are making our seas increasingly acidic. Millions of marine species are now threatened with extinction; fisheries face eradication; while reefs that protect coastal areas are starting to erode. Ocean acidification is now one of the most worrying threats to the planet, say marine biologists. "Just as Vulcano is pumping carbon dioxide into the waters around it, humanity is pouring more and more carbon dioxide into the atmosphere," Dr Jason Hall-Spencer, a marine biologist at Plymouth University, told a conference on the island last week. "Some of the billions of tonnes of carbon dioxide we emit each year lingers in the atmosphere and causes it to heat up, driving global warming. But about 30% of that gas is absorbed by the oceans where it turns to carbonic acid. It is beginning to kill off coral reefs and shellfish beds and threaten stocks of fish. Very little can live in water that gets too acidic." Hence science's renewed interest in Vulcano. Its carbon dioxide springs – which bubble up like burst water mains below the shallow seabed – provide researchers with a natural laboratory for testing the global impact of ocean acidification. "These vents and the carbonic acid they generate tell us a great deal about how carbon dioxide is going to affect the oceans and marine life this century," said Hall-Spencer. "And we should be worried. This problem is a train coming straight at us." Scientists estimate that oceans absorb around a million tonnes of carbon dioxide every hour and our seas are 30% more acidic than they were last century. This increased acidity plays havoc with levels of calcium carbonate, which forms the shells and skeletons of many sea creatures, and also disrupts reproductive activity. Among the warning signs recently noted have been the failures of commercial oyster and other shellfish beds on the Pacific coasts of the US and Canada. In addition, coral reefs – already bleached by rising global temperatures – have suffered calamitous disintegration in many regions. And at the poles and high latitudes, where the impact of ocean acidification is particularly serious, tiny shellfish called pteropods – the basic foodstuff of fish, whales and seabirds in those regions – have suffered noticeable drops in numbers. In each case, ocean acidification is thought to be involved. The problem was recently highlighted by the head of the US National Oceanic and Atmospheric Administration, Dr Jane Lubchenco. She described ocean acidification as global warming's "equally evil twin". It is a powerful comparison, though it is clear that of the two, the crisis facing our seas has received far less attention. The last UN climate assessment report was more than 400 pages long but had only two pages on ocean acidification – mainly because studies of the phenomenon are less well advanced than meteorological and atmospheric research in general. The workshop, held last week on Vulcano, is part of the campaign to understand the likely impact of ocean acidification. Dozens of young oceanographers, geologists and ecologists gathered for the meeting run by the Mediterranean Sea Acidification (MedSeA) programme. Dr Maoz Fine, of Bar-Ilan University in Israel, reported work on coral reef organisms that had been exposed to waters of different levels of acidity, temperature and light in his laboratory. "We found that species of coral reef respond differently to rising carbon dioxide levels," he said. "Bigger corals suffer but survive while smaller, branching varieties become less able to fight disease and die off. That sort of thing just makes it even more difficult to predict exactly what is going to happen to our oceans." Few scientists doubt that the impact on reefs will be anything short of devastating, however. The Caribbean has already lost about 80% of its coral reefs to bleaching caused by rising temperatures and by overfishing which removes species that normally aid coral growth. Acidification threatens to do the same for the rest of the world's coral reefs. "By the middle of the century there will probably be only a few pockets – in the North Sea and the Pacific. Millions of species of fish, shellfish and micro-organisms will be wiped out," said Fine. Acidification has affected the oceans in the past. However, these prehistoric events occurred at a far slower rate, said Dr Jerry Blackford of Plymouth Marine Laboratory. "The waters of the world take around 500 years to circulate the globe," he said. "If carbon dioxide was rising slowly, in terms of thousands of years, natural factors could then compensate. Sediments could buffer the carbonic acid, for example." But levels of carbon dioxide are rising much faster today. By the end of the century, surface seawater will be 150% more acidic than it was in 1800. "There is simply not enough time for buffering to come into effect and lessen the impact," said Blackford. "The result will be significant acid build-up in the upper parts of the oceans which, of course, are the parts that are of greatest importance to humans." A vision of the seas we are now creating can be seen at Vulcano. On the eastern side of its main bay, beyond an open-air thermal spa filled with elderly bathers wallowing in volcanically heated mud, there is a long stretch of black sand. Just offshore, in about four feet of water, silver beads of carbon dioxide stream up from stones that lie over an underground vent. The water, although cold, looks like a huge, frothing Jacuzzi. Water here is highly acidic and there is no marine life around the vent – not even seaweed. "The acidity here is far greater than even the worst ocean scenario for 2100, so we have to be careful about making comparisons," said Dr Marco Milazzo, of Palermo University. "However, currents carry that acid water round the bay and it becomes more and more dilute. We can then study waters which reflect the kind of acidity we are likely to get at the end of the century." Milazzo and his colleagues have placed open boxes containing coral and other forms of marine life in the waters round the bay and monitor the effects of the different levels of acidity in the sea water on these samples and also on the bay's natural marine life. "When I look one way, out to sea, where there is little acidity, the plant life is rich in reds, whites, greens and other colours. There is abundance and variety in the habitat," said Milazzo. "However, when I look the other way – back towards the carbon dioxide vent – that habitat gets less and less varied as the water gets more acidic. It is reduced to a dark brown bloom of macro-algae. There is no richness or variety here. In effect I am looking at the oceans of tomorrow. It is profoundly depressing." DEEP WATER Acidity is measured by its pH (power of hydrogen) value. Fresh water has a pH reading of 7. Readings below that are considered to be acidic. Those above 7 are alkaline. Surface sea water had a reading of 8.2 a century ago. Today it has dropped to 8.1 because so much carbon dioxide has been absorbed by the world's oceans. That may seem a small amount but the pH scale is logarithmic which means that 0.1 difference actually represents an increase in acidity of 30%. By the end of the century, the pH of surface sea water could have dropped to 7.8, which represents a decrease in alkalinity – or an increase in acidity, depending on your viewpoint – of around 150%.

## 2AC Amazon

### Warming kills the Amazon – some loss is inevitable - it’s now or never

Adam, ‘9 – writer for the Guardian [David, The Guardian, “Amazon could shrink by 85% due to climate change, scientists say,” http://www.guardian.co.uk/environment/2009/mar/11/amazon-global-warming-trees, DS]

Global warming will wreck attempts to save the Amazon rainforest, according to a devastating new study which predicts that one-third of its trees will be killed by even modest temperature rises. The research, by some of Britain's leading experts on climate change, shows that even severe cuts in deforestation and carbon emissions will fail to save the emblematic South American jungle, the destruction of which has become a powerful symbol of human impact on the planet. Up to 85% of the forest could be lost if spiralling greenhouse gas emissions are not brought under control, the experts said. But even under the most optimistic climate change scenarios, the destruction of large parts of the forest is "irreversible". Vicky Pope, of the Met Office's Hadley Centre, which carried out the study, said: "The impacts of climate change on the Amazon are much worse than we thought. As temperatures rise quickly over the coming century the damage to the forest won't be obvious straight away, but we could be storing up trouble for the future." Tim Lenton, a climate expert at the University of East Anglia, called the study, presented at a global warming conference in Copenhagen today , a "bombshell". He said: "When I was young I thought chopping down the trees would destroy the forest but now it seems that climate change will deliver the killer blow." The study, which has been submitted to the journal Nature Geoscience, used computer models to investigate how the Amazon would respond to future temperature rises. It found that a 2C rise above pre-industrial levels, widely considered the best case global warming scenario and the target for ambitious international plans to curb emissions, would still see 20-40% of the Amazon die off within 100 years. A 3C rise would see 75% of the forest destroyed by drought over the following century, while a 4C rise would kill 85%. "The forest as we know it would effectively be gone," Pope said. Experts had previously predicted that global warming could cause significant "die-back" of the Amazon. The new research is the first to quantify the long-term effect. Chris Jones, who led the research, told the conference: "A temperature rise of anything over 1C commits you to some future loss of Amazon forest. Even the commonly quoted 2C target already commits us to 20-40% loss. On any kind of pragmatic timescale, I think we should see loss of the Amazon forest as irreversible." Peter Cox, professor of climate system dynamics at the University of Exeter, said the effects would be felt around the world. "Ecologically it would be a catastrophe and it would be taking a huge chance with our own climate. The tropics are drivers of the world's weather systems and killing the Amazon is likely to change them forever. We don't know exactly what would happen but we could expect more extreme weather." Massive Amazon loss would also amplify global warming "significantly" he said. "Destroying the Amazon would also turn what is a significant carbon sink into a significant source." Jones said the study showed that tree growth in high latitudes, such as Siberia, would increase, but would be unlikely to compensate for the carbon stocks lost from the Amazon. Even with drastic cuts in emissions in the next decade, scientists say that there will only be around a 50% chance of keeping global temperatures rises below 2C. This best-case emissions scenario is based on emissions peaking in 2015 and quickly changing from an increase of 2-3% per year to a decrease of 3% per year. For every 10 years this action is delayed, the most likely temperature rise increases by 0.5C. Environmental campaigners said they were alarmed by the predictions. "With a rise of over 2C you begin to see a large-scale change to savannah," said Beatrix Richards, head of forest policy and trade at WWF UK. "You also lose major ecosystem services, such as keeping carbon levels stable, providing indigenous people with goods and services, and balancing rainfall patterns globally from the US grain belt to as far away as Kazakhstan. A 4C [rise] is a nightmare scenario that would move us into uncharted territory." "People have known about the links between climate and forests for some time, but the alarming thing now is the level of certainty because real world observations are feeding into the computer models," said Tony Juniper, an environmental campaigner and Green party candidate. "There really is no time for delay. Governments must cooperate to cut industrial emissions while at the same time halting deforestation, otherwise we'll have a mass extinction and a global warming catastrophe." A separate study from the Met Office shows that, if temperatures do reach 2C, then there is a one-in-three chance they would stay that high for at least 100 years, whatever action was taken on carbon pollution. The results were announced on the second day of a key climate science meeting in Copenhagen, which is intended to spur politicians into taking action to cut carbon pollution. It comes ahead of a UN summit in December, also in Copenhagen, where officials will try to agree a new global deal on climate to replace the Kyoto protocol. The results from the meeting will be published in the summer as a supplement to the 2007 report of the Intergovernmental Panel on Climate Change. Positive feedback Amazon dieback is one of the key positive feedbacks brought about by global warming. These are typically runaway processes in which global temperature rises lead to further releases of CO², which in turn brings about more global warming. In the Amazon this happens on a more localised scale but the result, increased forest death, also releases carbon into the atmosphere. Experts predict that higher worldwide temperatures will reduce rainfall in the Amazon region, which will cause widespread local drought. With less water and tree growth, "homegrown" rainfall produced by the forest will reduce as well, as it depends on water passed into the atmosphere above the forests by the trees. The cycle continues, with even less rain causing more drought, and so on. With no water, the root systems collapse and the trees fall over. The parched forest becomes tinderbox dry and more susceptible to fire, which can spread to destroy the still-healthy patches of forest. Other positive feedback effects expected by scientists, are releases of carbon stored in frozen arctic ecosystems and an increase in the sun's energy absorbed by the planet as ice melts.

## 2AC Water Wars

### Warming leads to water wars – extended droughts and floods escalate regional tensions

Struck, ‘7 – Washington Post Staff Writer [Doug, 8/20/2007, Washington Post, “Warming Will Exacerbate Global Water Conflicts,” http://www.washingtonpost.com/wp-dyn/content/article/2007/08/19/AR2007081900967.html, DS]

As global warming heats the planet, there will be more desperate measures. The climate will be wetter in some places, drier in others. Changing weather patterns will leave millions of people without dependable supplies of water for drinking, irrigation and power, a growing stack of studies conclude. At Stanford University, 170 miles away, Stephen Schneider, editor of the journal Climatic Change and a lead author for the authoritative Intergovernmental Panel on Climate Change (IPCC), pours himself a cup of tea and says the future is clear. "As the air gets warmer, there will be more water in the atmosphere. That's settled science," he said. But where, and when, it comes down is the big uncertainty. "You are going to intensify the hydrologic cycle. Where the atmosphere is configured to have high pressure and droughts, global warming will mean long, dry periods. Where the atmosphere is configured to be wet, you will get more rain, more gully washers. "Global warming will intensify drought," he says. "And it will intensify floods." According to the IPCC, that means a drying out of areas such as southern Europe, the Mideast, North Africa, South Australia, Patagonia and the U.S. Southwest. These will not be small droughts. Richard Seager, a senior researcher at Lamont-Doherty Earth Observatory of Columbia University, looked at 19 computer models of the future under current global warming trends. He found remarkable consistency: Sometime before 2050, the models predicted, the Southwest will be gripped in a dry spell akin to the Great Dust Bowl drought that lasted through most of the 1930s. The spacing of tree rings suggests there have been numerous periods of drought going back to A.D. 800, he said. But, "mechanistically, this is different. These projections clearly come from a warming forced by rising greenhouse gases." Farmers in the Central Valley, where a quilt of lush, green orchards on brown hills displays the alchemy of irrigation, want to believe this is a passing dry spell. They thought a wet 2006 ended a seven-year drought, but this year is one of the driest on record. For the first time, state water authorities shut off irrigation pumps to large parts of the valley, forcing farmers to dig wells. Farther south and east, the once-mighty Colorado River is looking sickly, siphoned by seven states before dribbling into Mexico. Its reservoirs, Lake Mead and Lake Powell, are drying, leaving accusatory rings on the shorelines and imperiling river-rafting companies. Seager predicts that drought will prompt dislocations similar to those of the Dust Bowl. "It will certainly cause movements of people. For example, as Mexico dries out, there will be migration from rural areas to cities and then the U.S.," he said. "There is an emerging situation of climate refugees." Global warming threatens water supplies in other ways. Much of the world's fresh water is in glaciers atop mountains. They act as mammoth storehouses. In wet or cold seasons, the glaciers grow with snow. In dry and hot seasons, the edges slowly melt, gently feeding streams and rivers. Farms below are dependent on that meltwater; huge cities have grown up on the belief the mountains will always give them drinking water; hydroelectric dams rely on the flow to generate power. But the atmosphere's temperature is rising fastest at high altitudes. The glaciers are melting, initially increasing the runoff, but gradually getting smaller and smaller. Soon, many will disappear. At the edge of the Quelccaya Glacier, the largest ice cap in the Peruvian Andes, Ohio State University researcher Lonnie Thompson sat in a cold tent at a rarified 17,000 feet. He has spent more time in the oxygen-thin "death zone" atop mountains than any other scientist, drilling ice cores and measuring glaciers. He has watched the Quelccaya Glacier shrink by 30 percent in 33 years. Down the mountain, a multitude of rivulets seep from the edge of Quelccaya to irrigate crops of maize, the water flowing through irrigation canals built by the Incas. Even farther downstream, the runoff helps feed the giant capital, Lima, another city built in a desert. "What do you think is going to happen when this stops?" Thompson mused of the water. "Do you think all the people below will just sit there? No. It's crazy to think they won't go anywhere. And what do you think will happen when they go to places where people already live?" The potential for conflict is more than theoretical. Turkey, Syria and Iraq bristle over the Euphrates and Tigris rivers. Sudan, Ethiopia and Egypt trade threats over the Nile. The United Nations has said water scarcity is behind the bloody wars in Sudan's Darfur region. In Somalia, drought has spawned warlords and armies. Already, the World Health Organization says, 1 billion people lack access to potable water. In northern China, retreating glaciers and shrinking wetlands that feed the Yangtze River prompted researchers to warn that water supplies for hundreds of millions of people may be at risk. "The government is talking about harmony between man and nature. But we still haven't seen the turning point," Ma Jun, author of "China's Water Crisis," said in a phone interview from Beijing. Even where global warming brings more precipitation, it may come at the wrong time. If precipitation that traditionally feeds a glacier comes too early, as rain instead of snow, the result is a quick torrent followed by months of meager trickle. And if the rain comes in torrents, it brings scenes like those this summer from Texas and India. Humans have long attempted to reconcile nature's inconstancies with giant plumbing: reservoirs and dams that hold back floodwaters for more gradual release; dikes and other barriers to protect developed areas; canals and pipelines to take water from wet areas to dry. But that kind of infrastructure is expensive, especially for Third World governments. Environmentalists decry the impact on wildlife. And building dams in earthquake zones tempts disaster. Even in rich California, "there's been no significant reservoir construction for many years," said Dave Kranz, a spokesman for the state Farm Bureau. "Reservoir construction is terribly expensive. It's easier to block a reservoir than to build one." Researcher Seager suggests that humans ought to bend more to nature than trying to bend nature. "We're not going to be able to carry on like we are," he said. "Do we really want to keep growing irrigated alfalfa in the high desert, in New Mexico and Arizona? It really makes no sense." But Mark McKean, a Fresno Valley farmer, had to leave some of his fields of cotton unwatered when the flow in the irrigation canals stopped this summer. But he chafes at Seager's suggestion. "Sure, my tomatoes can be grown in other parts of the world," he said. "But do we want to give up the economic base that supports small, rural towns? Do we want to ignore child labor growing our food somewhere else? Do we want to know if pesticides are being used? What are we willing to pay for all that?"

## 2AC Indo-Pak War

### Warming causes Indo-Pak war – breaks down cooperation and comparatively outweighs

Faris, ‘9 – author of Forecast: The Consequences of Climate Change [Stephen, Foreign Policy, “The Failed States Index 2009,” http://www.foreignpolicy.com/articles/2009/06/22/failed\_states\_index\_the\_last\_straw, DS]

Hopelessly overcrowded, crippled by poverty, teeming with Islamist militancy, careless with its nukes—it sometimes seems as if Pakistan can’t get any more terrifying. But forget about the Taliban: The country's troubles today pale compared with what it might face 25 years from now. When it comes to the stability of one of the world's most volatile regions, it's the fate of the Himalayan glaciers that should be keeping us awake at night. In the mountainous area of Kashmir along and around Pakistan's contested border with India lies what might become the epicenter of the problem. Since the separation of the two countries 62 years ago, the argument over whether Kashmir belongs to Muslim Pakistan or secular India has never ceased. Since 1998, when both countries tested nuclear weapons, the conflict has taken on the added risk of escalating into cataclysm. Another increasingly important factor will soon heighten the tension: Ninety percent of Pakistan's agricultural irrigation depends on rivers that originate in Kashmir. "This water issue between India and Pakistan is the key," Mohammad Yusuf Tarigami, a parliamentarian from Kashmir, told me. "Much more than any other political or religious concern." Until now, the two sides had been able to relegate the water issue to the back burner. In 1960, India and Pakistan agreed to divide the six tributaries that form the Indus River. India claimed the three eastern branches, which flow through Punjab. The water in the other three, which pass through Jammu and Kashmir, became Pakistan's. The countries set a cap on how much land Kashmir could irrigate and agreed to strict regulations on how and where water could be stored. The resulting Indus Waters Treaty has survived three wars and nearly 50 years. It's often cited as an example of how resource scarcity can lead to cooperation rather than conflict. But the treaty's success depends on the maintenance of a status quo that will be disrupted as the world warms. Traditionally, Kashmir's waters have been naturally regulated by the glaciers in the Himalayas. Precipitation freezes during the coldest months and then melts during the agricultural season. But if global warming continues at its current rate, the Intergovernmental Panel on Climate Change estimates, the glaciers could be mostly gone from the mountains by 2035. Water that once flowed for the planting will flush away in winter floods. Research by the global NGO ActionAid has found that the effects are already starting to be felt within Kashmir. In the valley, snow rarely falls and almost never sticks. The summertime levels of streams, rivers, springs, and ponds have dropped. In February 2007, melting snow combined with unseasonably heavy rainfall to undermine the mountain slopes; landslides buried the national highway—the region's only land connection with the rest of India—for 12 days. Normally, countries control such cyclical water flows with dams, as the United States does with runoff from the Rocky Mountains. For Pakistan, however, that solution is not an option. The best damming sites are in Kashmir, where the Islamabad government has vigorously opposed Indian efforts to tinker with the rivers. The worry is that in times of conflict, India's leaders could cut back on water supplies or unleash a torrent into the country's fields. "In a warlike situation, India could use the project like a bomb," one Kashmiri journalist told me. Water is already undermining Pakistan's stability. In recent years, recurring shortages have led to grain shortfalls. In 2008, flour became so scarce it turned into an election issue; the government deployed thousands of troops to guard its wheat stores. As the glaciers melt and the rivers dry, this issue will only become more critical. Pakistan—unstable, facing dramatic drops in water supplies, caged in by India's vastly superior conventional forces—will be forced to make one of three choices. It can let its people starve. It can cooperate with India in building dams and reservoirs, handing over control of its waters to the country it regards as the enemy. Or it can ramp up support for the insurgency, gambling that violence can bleed India's resolve without degenerating into full-fledged war. "The idea of ceding territory to India is anathema," says Sumit Ganguly, a professor of political science at Indiana University. "Suffering, particularly for the elite, is unacceptable. So what's the other option? Escalate." "It's very bad news," he adds, referring to the melting glaciers. "It's extremely grim." The Kashmiri water conflict is just one of many climate-driven geopolitical crises on the horizon. These range from possible economic and treaty conflicts that will likely be resolved peacefully—the waters of the Rio Grande and Colorado River have long been a point of contention between the United States and Mexico, for instance—to possible outright wars. In 2007, the London-based NGO International Alert compiled a list of countries with a high risk of armed conflict due to climate change. They cited no fewer than 46 countries, or one in every four, including some of the world's most gravely unstable countries, such as Somalia, Nigeria, Iran, Colombia, Bolivia, Israel, Indonesia, Bosnia, Algeria, and Peru. Already, climate change might be behind the deep drought that contributed to the conflict in the Darfur region of Sudan and hundreds of thousands of deaths. Rising global temperatures are putting the whole world under stress, and the first countries to succumb will be those, such as Sudan, that are least able to adapt. Compare the Netherlands and Bangladesh: Both are vulnerable to rises in sea levels, with large parts of their territory near or under the level of the waves. But the wealthy Dutch are building state-of-the-art flood-control systems and experimenting with floating houses. All the impoverished Bangladeshis can do is prepare to head for higher ground. "It's best not to get too bogged down in the physics of climate," says Nils Gilman, an analyst at Monitor Group and the author of a 2006 report on climate change and national security. "Rather, you should look at the social, physical, and political geography of regions that are impacted." Indeed, with a population half that of the United States crammed into an area a little smaller than Louisiana, Bangladesh might be among the most imperiled countries on Earth. In a normal decade, the country experiences one major flood. In the last 11 years, its rivers have leapt their banks three times, most recently in 2007. That winter, Cyclone Sidr, a Category 5 storm, tore into the country's coast, flattening tin shacks, ripping through paddies, and plunging the capital into darkness. As many as 10,000 people may have died. Bangladesh's troubles are likely to ripple across the region, where immigration flows have been historically accompanied by rising tensions. In India's northeastern state of Assam, for instance, rapidly changing demographics have led to riots, massacres, and the rise of an insurgency. As global warming tightens its squeeze on Bangladesh, these pressures will mount. And in a worst-case scenario, in which the country is struck by sudden, cataclysmic flooding, the international community will have to cope with a humanitarian emergency in which tens of millions of waterlogged refugees suddenly flee toward India, Burma, China, and Pakistan. Indeed, the U.S. military has come to recognize that weakened states—the Bangladeshes and Pakistans of the world—are often breeding grounds for extremism, terrorism, and potentially destabilizing conflict. And as it has done so, it has increasingly deployed in response to natural disasters. Such missions often require a warlike scale of forces, if not warlike duration. During the 2004 Indian Ocean tsunami, for instance, the United States sent 15,000 military personnel, 25 ships, and 94 aircraft. "The military brings a tremendous capacity of command-and-control and communications," says retired Gen. Anthony Zinni, the former head of U.S. Central Command. "You have tremendous logistics capability, transportation, engineering, the ability to purify water." As the world warms, more years could start to look like 2007, when the U.N. Office for the Coordination of Humanitarian Affairs announced it had responded to a record number of droughts, floods, and storms. Of the 13 natural disasters it responded to, only one—an earthquake in Peru—was not related to the climate. Worryingly, some analysts have suggested the United States might not fully grasp what it needs to respond to this challenge. The U.S. military has been required by law since 2008 to incorporate climate change into its planning, but though Pentagon strategic documents describe a climate-stressed future, there's little sign the Department of Defense is pivoting to meet it. "Most of the things that the military is requesting are still for a conventional war with a peer competitor," says Sharon Burke, an energy and climate change specialist at the Washington-based Center for a New American Security. "They say they're going to have more humanitarian missions, but there's no discussion at all of ‘What do you need?'" The rate at which the war in Iraq has chewed through vehicles and equipment, for instance, has astonished military planners. "Is this a forewarning of what it's like to operate in harsher conditions?" Burke asks. To be sure, some of the more severe consequences of climate change are expected to unfold over a relatively extended time frame. But so does military development, procurement, and planning. As global warming churns the world's weather, it's becoming increasingly clear that it's time to start thinking about the long term. In doing so, the West may need to adopt an even broader definition of what it takes to protect itself from danger. Dealing with the repercussions of its emissions might mean buttressing governments, deploying into disaster zones, or tamping down insurgencies. But the bulk of the West's effort might be better spent at home. If the rivers of Kashmir have the potential to plunge South Asia into chaos, the most effective response might be to do our best to ensure the glaciers never melt at all.

## Biodiversity

### Now key – biodiversity’s at a tipping point – further losses exacerbate poverty and climate change

Vidal, ’10 – Environment editor at The Guardian [John, 8/17/2010, The Guardian, “The real butterfly effect: destroying nature will ruin economies and cultures, pleads UN: Biodiversity chief to push for more ambitious targets Damage to natural world 'reaching tipping point',” Lexis, DS]

Britain and other countries face a collapse of their economies and loss of culture if they do not protect the environment better, the world's leading champion of nature has warned. "What we are seeing today is a total disaster," said Ahmed Djoghlaf, the secretary-general of the UN Convention on Biological Diversity. "No country has met its targets to protect nature. We are losing biodiversity at an unprecedented rate. If current levels (of destruction) go on we will reach a tipping point very soon. The future of the planet now depends on governments taking action in the next few years." Industrialisation, population growth, the spread of cities and farms, and climate change are all now threatening the fundamentals of life itself, said Djoghlaf, in London before a UN meeting in which governments are expected to sign up to a more ambitious deal to protect nature. "Many plans were developed in the 1990s to protect biodiversity but they are still sitting on the shelves of ministries. Countries were legally obliged to act, but only 140 have even submitted plans and only 16 have revised their plans since 1993. Governments must now put their houses in order," he said. According to the UN Environment Programme, the Earth is in the middle of a mass extinction of life. Scientists estimate that 150-200 species of plant, insect, bird and mammal become extinct every 24 hours. This is nearly 1,000 times the "natural" or "background" rate and, claim many biologists, is greater than anything the world has experienced since the dinosaurs vanished nearly 65m years ago. Around 15% of mammal species and 11% of bird species are classified as threatened with extinction. Djoghlaf warned Britain and other countries not to cut nature protection amid the recession. In a reference to expected 40% cuts in Britain's Department of the Environment spending, he said: "You may well save a few pounds now but you will lose billions later. Biodiversity is your natural asset. The more you lose it, the more you lose your cultural assets too." Djoghlaf said 300 million people who depended on forests and the more than 1 billion who lived off sea fishing were in immediate danger."Cut your forests down, or over-fish, and these people will not survive. Destroying biodiversity only increases economic insecurity. The more you lose it, the more you lose the chance to grow." He added: "The loss of biodiversity compounds poverty. Biodiversity is fundamental to social life, education and aesthetics. It's a human right to live in a healthy environment." Djoghlaf criticised countries for separating action on climate change from protecting biodiversity. "The loss of biodiversity exacerbates climate change. But it is handled by the poorest ministries in government, it has not been mainstreamed or prioritised by governments. Climate change cannot be solved without action on biodiversity, and vice versa." The UN chief said that children were losing contact with nature. "In Algeria, children are growing up who have never seen olive trees. How can you protect nature if you do not know it?" A UN report on the impact of biodiversity loss, out in October, is expected to say that the economic case for global action to stop species destruction is even more powerful than the argument for tackling climate change. It will say that saving biodiversity is cost-effective and the benefits from saving "natural goods and services", such as pollination, medicines, fertile soils, clean air and water, are between 10 and 100 times the cost of saving the habitats and species that provide them.

### Biodiversity exacerbates poverty and climate change

Adegboye, ’10 – [Kingsley, Vanguard (Lagos), “Publication Stresses Role for Biodiversity in Fight Against Climate Change,” Lexis, DS]

Nature's riches can play a major role in poverty eradication, but only if governments and businesses recognise the true economic value of the goods and services our environment provides us. This is the central message of a free book published by the International Institute for Environment and Development (IIED), Birdlife International and Pavan Sukhdev, leader of The Economics of Ecosystems and Biodiversity study. It warns that biodiversity loss is not only an environmental problem but also a fundamental threat to people's livelihoods, well-being and ability to confront the impacts of climate change. The publication comes on the eve of the world's biggest international conference on biodiversity, in Nagoya, Japan. "The ongoing decline of the world's biological resources such as rainforests, coral reefs and agricultural biodiversity threatens to increase poverty and people's vulnerability to climate change," says Dr. Dilys Roe , a senior researcher at IIED. "These challenges must be tackled together rather than in isolation." The book shows how nature provides humanity with goods and services worth trillions of dollars. But it warns that these benefits are threatened by policies that fail to treat the environment and human well being as two sides of the same coin. Biodiversity includes the crops we eat and the insects that pollinate them; the plants we use for both traditional medicines and modern drugs; the bacteria that help create the soil that sustains farming; and the microscopic plankton at the base of food chains that end with fish on our dinner plates. It includes ecosystems such as forests that regulate water supplies and the global climate. While millions of the world's poorest people depend heavily on nature for their livelihoods, efforts to use biodiversity to boost incomes often fail because of poor policies and legal frameworks that govern how biological resources are used and by whom. "Systems that communities have developed over generations to sustainably manage their natural resources have often been swept aside by policies that favour short-term commercial gains," says David Thomas of BirdLife International. "By supporting these communities' long-term stewardship of the land and the sea, policymakers can tackle two urgent global issues extreme poverty and the loss of biodiversity - at the same time." The book outlines the economic, scientific and moral arguments for shifting to a new way of managing the Earth's resources that brings benefits to all in a sustainable way.

## Ocean Biodiversity

### Climate change kills marine biodiv

Bagley, 6/12 – freelance climate writer [Katherine, 6/12/2011, Reuters, “Climate Change Drives Disease in Seaweed Species, Study Finds,” http://www.reuters.com/article/2011/07/12/idUS113986751820110712, DS]

Rising ocean temperatures due to global warming have already been linked to coral reef deaths, destructive storms, shifting species distributions and harmful algal blooms. Now, a team of Australian researchers is adding a new and similarly daunting concern to that list: the spread of disease in "habitat-forming" seaweeds that are critical to marine health. Scientists fear that the widespread loss of these seaweeds could have disastrous effects on creatures that rely on them for food and protection, such as sea hares, sea urchins and dozens of fish and invertebrate species. "Seaweeds are the 'trees' of coastal temperate systems," said Peter Steinberg, a marine biologist at the University of New South Wales and director of the Sydney Institute of Marine Science, who helped lead the research that was published in the journal Global Change Biology last month. "They provide the food and habitat for many of the other organisms that live there. Without them, these systems are radically different," he said. Earlier studies documented rapid decline and disease in seaweeds during the past two decades, but this analysis was the first to examine whether climate change is driving illness in habitat-forming stands that provide life to vast numbers of marine organisms. In a 2008 study, for instance, biologists failed to locate the seaweed Phyllospora comosa along a 45-mile stretch of New South Wales, Australia — despite evidence to suggest that the species covered the coastline 50 years ago and would still be there. A previous paper published in 1995 in the journal Science found that off Australia's coast the amount of coralline algal pathogen, a bacteria that infects coral and other habitat-forming plants, jumped from zero to 100 percent in just one year. The new study by Steinberg and colleagues from the University of New South Wales in Sydney focused on Delisea pulchra, a type of red algae, or seaweed, found in an area around Australia, New Zealand and Antarctica considered to be a global warming hot spot. Ocean temperatures in that region have already increased at rates well above the global average — roughly 3.6 degrees Fahrenheit in the last century, due to the strengthening of the East Australian Current system that flows south toward the South Pole. In normal conditions, D. pulchra produces molecules known as halogenated furanones that bind to bacterial receptor sites, acting as a kind of chemical defense against infection. Through field and lab observations, however, researchers discovered that in warmer waters — in this case, in temperatures ranging from 57 to 79 degrees Fahrenheit — the seaweeds showed higher levels of disease, or "bleaching." They also found that seaweeds injected with antibiotics in the hot waters experienced less disease than those in similar temperatures that were left untreated, indicating that increased bacterial activity was driving disease. The researchers believe that higher temperatures stress the seaweeds so much that they can no longer allocate resources to support their chemical defense systems, leaving their bacterial receptor sites open to attack. Rising temperatures also stimulate microbial populations to flourish and become more virulent, and to aggressively seek out surfaces on which to attach. With a weaker defense mechanism and stronger bacteria, seaweed can become diseased, or bleached, with relative ease, Steinberg said. In this way, the process is not unlike coral bleaching, he said, which occurs when algae that live in the tissues of coral polyps are killed off from abnormally warm water. "In terms of climate change and climatic variation it has been known for some time that similar mechanisms operate on corals and seagrasses," Thomas Wernberg, a marine biologist at the University of Western Australia's Oceans Institute, who was not involved in the research, told SolveClimate News. "These experiments extend this knowledge to a group of organisms that are more widespread and probably much more ecologically and socioeconomically important for the marine environment on a global scale," Wernberg said. "[These findings are] an exciting discovery with great implications." Implications for Managing Seaweeds Without these seaweeds, grazing species of fish and invertebrates would lose a vital food source. These same creatures — along with encrusting animals that must anchor themselves onto a surface for survival, such as barnacles, sea sponges and corals — would also lose their habitat. According to Steinberg, the findings, the first of their kind, may help researchers and conservationists more effectively manage the seaweeds in a warming climate. "Historically, disease has been challenging to study relative to other ecological factors like competition, predation or nutrients because of many of the difficulties associated with studying bacteria or other microbes in the field," said Steinberg. "But once you understand the mechanisms by which climate change impacts organisms, it generally helps you manage these systems. If you know the factors that cause or facilitate disease, you can put effort into protecting those populations that are less affected, such as those in colder water or outside the range of particular pathogens." Steinberg also noted that some pathogens in coral systems seem to be associated with bacteria-rich run-off from land-based energy pollution, meaning that the presence of some bacteria can potentially be managed through marine protected areas. Sandra Brooke, a marine biologist and director of coral conservation for the Marine Conservation Biology Institute who was not involved in the research, agrees. "We are now starting to see the effects of historic fossil-fuel combustion and cannot prevent the outcome," she said. "The only way we can mitigate the effects of global climate change is by making vulnerable ecosystems as healthy as they can be, [which will make them] more resilience to disease, predation and other stressors that may occur as a result of temperature increase and ocean acidification. This should be the objective of future management actions, through implementation of protected areas and improvement of water quality in coastal zones." More Research to Come Steinberg and his colleagues are currently investigating how climate change influences the chemical defense systems of several other dominant seaweeds along the Australian coast. Wernberg, the marine biologist at the University of Western Australia's Oceans Institute, expects Steinberg and his colleagues to find similar disease-temperature connections as they broaden their research to include other seaweeds. For example, he said, this year Western Australia experienced a "marine heatwave" with seawater temperatures 3.6 to 7.2 degrees Fahrenheit above normal for a prolonged period. Anecdotal evidence suggests that this heat wave was associated with significant amounts of bleaching of kelps.

## African Biodiversity

### Warming kills African biodiversity

Mano, ’10 – writer for The Herald [Costa, 9/28/2010, The Herald, “Zimbabwe: Climate Change Threat to Biodiversity – Nkomo,” Lexis, DS]

Climate change has the potential to pose major challenges to biodiversity-based tourism in many parts of Africa including Zimbabwe, Vice President John Nkomo has said. In his address at the commemoration of the World Tourism Day here yesterday, VP Nkomo said climate change could negatively affect the livelihoods of thousands of people and their national and local economies. This year's commemorations were held under the theme, "Tourism and Biodiversity." "In recent years, the biggest threat to biodiversity has been climate change, which in itself is mainly a result of global warming. "A decrease in rainfall could threaten important wetlands and water bodies and ecosystems they support, not withstanding devastation to agriculture." He said incidences of veld and forest fires, which were major causes of biodiversity loss already were affecting the tourism industry in this country. The result would be significant ecosystem changes that could cause species loss and changes in biological composition and diversity. "There is therefore, need for extensive high level research into the likely effects of rapid climate change at local level since changes have envisaged on global or regional scales do not always apply at the local level or affect local ecosystems. "Scientific and policy institutions must be capacitated to enable responses to the changing climate to be focused, relevant and at the least cost possible." Since the mid 1980s, VP Nkomo noted, the trend towards local communities be encouraged to be actively involved in conservation efforts, has led to the emergency of eco-tourism as a more responsible form of nature based activity that promotes conservation of biodiversity and also brings benefits to local communities. He said in a growing number of instances, tourism generated funds for the sustenance of local communities and that's providing local people with an economic incentive to protect biodiversity. Communities that receive significant income from tourism may be motivated to conserve biodiversity. "However, if benefits are small or not sufficiently linked with conservation inputs, they may be reinvested in activities that undermine biodiversity such as clearance or destruction of forested areas for agricultural purposes and livestock rearing," he said. He said biodiversity was especially important in rural areas since approximately 70 percent of the country's 12 million people lived in communal areas covering 42 percent of the country's total land area. These people V.P Nkomo added, depended on bio diversity to provide a subsistence livelihood and in some cases a modest cash income. The VP said in Zimbabwe the socio economic challenges, which the country faced in the aftermath of the land reform programme resulted in all biodiversity conservation initiatives that had hither to be launched, gradually dying due to lack of funding. "Most of these projects were supported financially and materially by NGOs, mainly the Southern Alliance for Indigenous Resources. "As funding and other support dwindled so did the fortunes of campfire and other community based tourism enterprises as well as the hopes, aspirations and livelihoods of the concerned communities. "He added that sustainable development of economic sectors, including tourism should now be top priority for all countries worldwide. The Governor and Resident Minister of Matabeleland North Province, Thokozile Mathuthu said communities and all stakeholders should thrive to control environmental degradation as that had a negative impact on the state of the environment. She said degradation of the environment also had a direct influence on the tourist arrivals. "If environmental degradation is not controlled, it will lead to decline in tourist arrivals and that will in turn lead to the decline in revenue generation and that will see the communities getting affected through unemployment. "So it is of utter importance that we take care of our environment wherever we are," she said. She noted that the tourism sector had witnessed an upsurge in arrivals during the third quarter. "The country is a well-known green destination and therefore we must strive to maintain that status, sustaining bio diversity. We need conservation programmes so that we get the competitive edge. Local communities should be educated on what biodiversity is so that they appreciate it in promoting and conserving bio diversity," she said.

### Climate change kills Africa’s plants – computer simulation proves – our evidence is reverse causal

SciDev, ‘5 [“Climate Change ‘Threatens to Evict African Plants,’” SciDev.net: Africa News, Lexis, DS]

Climate change could drastically alter the distribution of thousands of plant species across Africa, say scientists. The researchers, led by Jon Lovett of the University of York in the United Kingdom, looked at 5,197 species of African plants -- about 10-15 per cent of the continent's plant species. Using computer models that predict future climate, the researchers concluded that by 2085, the habitats in which nearly all of these plants can live would either shrink or shift, often to higher altitudes, as a result of anticipated changes in Africa's climate. Lovett says the team did not look explicitly at the risk of species extinction, but at the loss of areas with a suitable climate for the plant species studied. They say that for between one-quarter and one-half of the species they studied, there will be no part of Africa with a suitable climate by 2085. The study will be published this month in the Annals of the Missouri Botanical Garden, a leading journal for research on African vegetation. The researchers say changes will be particularly drastic in the forests of West Africa, stretching from Guinea to the Congo basin. They believe the predicted changes in plant distribution could mirror the large-scale decline in West African forests that occurred 2,500 years ago during the last Ice Age. Other areas expected to be hard hit are eastern Africa and the continent's south-west coast. Climate change is a factor that needs to be taken into account when identifying areas in Africa that are important to plant conservation, say the researchers. Lovett told SciDev.Net that his research suggests climate change could greatly reduce the availability of medicinal plants in Africa. According to the World Health Organization, nearly three-quarters of Africans rely on traditional medicines derived from local plants. "This is an important piece of work, providing a more comprehensive picture of the threats to African plants from climate change than has previously been available," says Chris Thomas, also at the University of York, though not part of Lovett's team. He says Lovett's team estimates are based on conservative estimates of future climate change. Last year, Thomas and colleagues published research in Nature that claimed that a substantial proportion of the world's biodiversity was under threat of extinction from climate change (see Climate change 'threatens one million species'). The study came under fire from researchers at the University of Oxford who doubted the possibility of predicting with accuracy the fate of global biodiversity using a computer model of just 1,103 species, as the authors had done. They also criticised the press announcement issued to the media, which claimed that a quarter of land animals and plants could eventually go extinct if climate change was left unchecked (see Inaccurate media reports hinder conservation efforts). The changes predicted by Lovett's team do not necessarily imply that the species will go extinct, but ecologists tend to agree that significant reductions in the area a species can inhabit will reduce their likelihood of survival. "The percentage of species at risk of extinction is expected to increase with atmospheric carbon dioxide concentrations," says Thomas. "These emissions are changing the climate, and effectively exporting extinction to other parts of the world, including Africa. Therefore, the obvious answer is to take action to minimise atmospheric carbon dioxide levels." Lovett's team compared the climate in 1975 to future scenarios predicted for 2025, 2055 and 2085 using climate models created by the UK Met Office's Hadley Centre. They used three distinct computer models to predict which plants would be affected by changing climate. Although the models disagreed on the exact extent of the problem, they each suggested that changes to Africa's vegetation would be profound.

## \*\*\*AT: Warming Good\*\*\*

## AT: CO2 Ag-Defense- Uniqueness

### We control uniqueness – agriculture collapsing

Gillis 6/4 – staff writer at New York Times [Justin, New York Times, “A Warming Planet Struggles to Feed Itself,” http://www.nytimes.com/2011/06/05/science/earth/05harvest.html?\_r=1&ref=justingillis&pagewanted=all, DS]

Hope in a stalk of grain: It is a hope the world needs these days, for the great agricultural system that feeds the human race is in trouble. The rapid growth in farm output that defined the late 20th century has slowed to the point that it is failing to keep up with the demand for food, driven by population increases and rising affluence in once-poor countries. Consumption of the four staples that supply most human calories — wheat, rice, corn and soybeans — has outstripped production for much of the past decade, drawing once-large stockpiles down to worrisome levels. The imbalance between supply and demand has resulted in two huge spikes in international grain prices since 2007, with some grains more than doubling in cost. Those price jumps, though felt only moderately in the West, have worsened hunger for tens of millions of poor people, destabilizing politics in scores of countries, from Mexico to Uzbekistan to Yemen. The Haitian government was ousted in 2008 amid food riots, and anger over high prices has played a role in the recent Arab uprisings. Now, the latest scientific research suggests that a previously discounted factor is helping to destabilize the food system: climate change. Many of the failed harvests of the past decade were a consequence of weather disasters, like floods in the United States, drought in Australia and blistering heat waves in Europe and Russia. Scientists believe some, though not all, of those events were caused or worsened by human-induced global warming. Temperatures are rising rapidly during the growing season in some of the most important agricultural countries, and a paper published several weeks ago found that this had shaved several percentage points off potential yields, adding to the price gyrations.

### High food prices are inevitable

Brown 2/15 - Staff writer for the Washington Times [Josh, 2/15/2011, The Washington Times, “Rising global food prices an ‘extreme poverty’ crisis,” http://www.washingtontimes.com/news/2011/feb/15/rising-global-food-costs-an-extreme-poverty-crisis, DS]

Skyrocketing global food prices have pulled more than 40 million people into "extreme poverty" and have almost reached the levels of June 2008, when the world was rocked by food riots. "The Bank's Food Price Index shows food prices are now 29 percent higher than they were a year ago and only three percent below the peak of the last food crisis in June 2008," World Bank Group President Robert Zoellick stated Tuesday. "Clearly, this is serious cause for concern." According to the newest Food Price Watch, the foods with the sharpest price spikes since June of last year include such staples as wheat, maize (corn), sugar and edible oils, with wheat prices increasing the most in past months. Corn prices are about 73 percent higher than they were last year, and sugar has seen its price rise by about that much. Wheat has become more expensive because of fears of crop damage from severe weather in such major producers as Australia and China. "The only reprieve we have at the moment is the fact that global rice prices have not matched the dramatic rises in wheat and other prices," Mr. Zoellick said. Recent data show that rice prices have risen at a slower rate and look to remain steady but still "need monitoring though" because some countries have dealt with an extreme rise in domestic rice prices, while others have not. Rising prices for grains also find their way into prices for meat, milk and other products from animals reliant on feed grains. India and China in particular, the report said, have seen strong inflation in prices for fruits, vegetables, milk and meat. The report also cited an "outbreak of the foot and mouth disease" in Mongolia along with extreme winter weather there in 2010. This led to a 32 percent increase in average mutton meat prices by the end of 2010. These critical rises in food prices have pushed "about 44 million people into extreme poverty." According to the report, only a few factors kept that number from rising, including the slower increase in rice prices and good harvests in Africa for such staples as corn and cassava. Higher poverty means people eat less and/or eat inferior, cheaper foods, producing "nutritional setbacks" that Food Price Watch stated will be especially severe for infants and pregnant women. World Bank released its report just a few days before the Group of 20 Meeting of Finance Ministers and Central Bank Governors in Paris, and its president emphasized the need for "G-20 to put food first." "In 2008, there were food riots. While not the primary cause for the political instability we see today in the Middle East, rising prices have nevertheless been an aggravating factor that could become more serious," Mr. Zoellick said. "We need global action to ensure we do a better job of feeding the hungry before we face the future challenges of feeding the expected 9 billion people in the world in 2050."

## AT: CO2 Ag- Defense- Warming Outweighs

### Warming outweighs CO2 – extreme weather offsets fertilization

Gillis 6/4 – staff writer at New York Times [Justin, New York Times, “A Warming Planet Struggles to Feed Itself,” http://www.nytimes.com/2011/06/05/science/earth/05harvest.html?\_r=1&ref=justingillis&pagewanted=all, DS]

For nearly two decades, scientists had predicted that climate change would be relatively manageable for agriculture, suggesting that even under worst-case assumptions, it would probably take until 2080 for food prices to double. In part, they were counting on a counterintuitive ace in the hole: that rising carbon dioxide levels, the primary contributor to global warming, would act as a powerful plant fertilizer and offset many of the ill effects of climate change. Until a few years ago, these assumptions went largely unchallenged. But lately, the destabilization of the food system and the soaring prices have rattled many leading scientists. “The success of agriculture has been astounding,” said Cynthia Rosenzweig, a researcher at NASA who helped pioneer the study of climate change and agriculture. “But I think there’s starting to be premonitions that it may not continue forever.” A scramble is on to figure out whether climate science has been too sanguine about the risks. Some researchers, analyzing computer forecasts that are used to advise governments on future crop prospects, are pointing out what they consider to be gaping holes. These include a failure to consider the effects of extreme weather, like the floods and the heat waves that are increasing as the earth warms. A rising unease about the future of the world’s food supply came through during interviews this year with more than 50 agricultural experts working in nine countries. These experts say that in coming decades, farmers need to withstand whatever climate shocks come their way while roughly doubling the amount of food they produce to meet rising demand. And they need to do it while reducing the considerable environmental damage caused by the business of agriculture. Agronomists emphasize that the situation is far from hopeless. Examples are already available, from the deserts of Mexico to the rice paddies of India, to show that it may be possible to make agriculture more productive and more resilient in the face of climate change. Farmers have achieved huge gains in output in the past, and rising prices are a powerful incentive to do so again. But new crop varieties and new techniques are required, far beyond those available now, scientists said. Despite the urgent need, they added, promised financing has been slow to materialize, much of the necessary work has yet to begin and, once it does, it is likely to take decades to bear results. “There’s just such a tremendous disconnect, with people not understanding the highly dangerous situation we are in,” said Marianne Bänziger, deputy chief of the International Maize and Wheat Improvement Center, a leading research institute in Mexico. A wheat physiologist at the center, Matthew Reynolds, fretted over the potential consequences of not attacking the problem vigorously. “What a horrible world it will be if food really becomes short from one year to the next,” he said. “What will that do to society?”

### Zero long-term solvency – carbon fertilization flattens out

Zabarenko, ‘7 – writer at Reuters [Deborah, 9/13/2007, Reuters, “Warming may hit world crop output,” Lexis, DS]

Global warming could send world agriculture into serious decline by 2080, with productivity collapsing in some developing countries while it improves in a few rich nations, a study reported yesterday. India, Pakistan, most of Africa and most of Latin America would be hit hardest, said economist William Cline, the study's author. The United States, most of Europe, Russia and Canada would probably see agricultural gains if climate change continues on its current course, the study found. Overall, the world's agricultural productivity was forecast to decline by between 3% and 16% by 2080, according to the study published by the Washington-based Center for Global Development and the Peterson Institute for International Economics. Among developed countries, Australia's outlook was bleakest, with predicted declines in crop yields ranging between 16% and 27%. In the developing world, fast-growing India's declines were forecast between 29% and 38%, while Sudan and Senegal both had predicted crop declines of more than 50%, essentially a collapse of agricultural productivity. The wide range between the low and high end of the forecast depends on how much carbon dioxide emissions actually spur some crops, Mr. Cline said. Plants absorb carbon dioxide, a climate-warming greenhouse gas emitted by coal-fired power plants, petroleum-fuelled vehicles and some natural processes. Some analysts maintain that global warming could actually be a boon to crops, making the impact of human-caused climate change negligible. They cite laboratory studies that have shown potential gains in crop yields of up to 30% when carbon dioxide emissions were increased. Mr. Cline disputed these contentions, saying that similar tests performed in farm fields have shown gains to be around 15%. He said the boost from so-called carbon fertilization tends to flatten out. For corn, there is already so much carbon dioxide in the atmosphere that putting more of this gas in the air would not help increase yields, Mr. Cline said. Wheat, rice and soybeans are continuing to benefit from increased carbon dioxide emissions, but that improvement is likely to taper off, he said. "It turns out that global yields for the major cereal [crops] have in fact slowed down, that the Green Revolution has slowed down," Mr. Cline said, referring to the global technological transformation of agriculture between the 1940s and 1960s. "There's already a sign that there is fatigue in the Green Revolution," he said, noting that the average annual growth in yields in the 1960s and 1970s was 2.6% per year, but by the 1980s and 1990s it had slowed to 1.8%. "The problem is that you need the technical change to keep up with demand for food," Mr. Cline said. "I estimate that the global demand for food after you take into account higher population, as well as higher incomes, would about triple from now to late in the century." Northern countries such as parts of the United States, Russia and Canada would have longer growing seasons due to global warming. But Mr. Cline said the world probably could not rely on increased crop yields in those areas. "By the end of the century, they're probably going to be earning so much money from their energy exports that their exchange rates are going to be very strong," he said. These strong currencies would make it prohibitively expensive for most other countries to buy Russian or Canadian agricultural goods.

### CO2 doesn’t boost yields – their evidence is short-term and hypothetical

Jackson 9 – Research molecular biologist at USDA [Eric, 2009, “The international food system and the climate crisis,” The Panama News, Lexis]

A major weakness in the forecasts of the IPCC and others when it comes to agriculture is that their predictions accept a theory of “carbon fertilization,” which argues that higher levels CO2 in the atmosphere will enhance photosynthesis in many key crops, and boost their yields. Recent studies show that this is a mirage. Not only does any initial acceleration in growth slow down significantly after a few days or weeks, but the increase in CO2 reduces nitrogen and protein in the leaves by more than 12 percent. This means that, with climate change, there will be less protein for humans in major cereals such as wheat and rice. There will also be less nitrogen in the leaves for bugs, which means that bugs will eat more leaf, leading to important reductions in yield.

### Long-term warming overtakes short-term benefits

Press Trust of India, ‘7 - Major newspaper, citing William Cline [9/13/2007, Press Trust of India, “Global warming may severely affect world agriculture,” Lexis, DS]

Global warming could send world agriculture into serious decline within this century, and the hardest hit will be developing countries like India and most of Africa and Latin America, a new study suggests. Developing countries, many with average temperatures that are already near or above crop tolerance levels, are predicted to suffer an average 10 to 25 per cent decline in agricultural productivity by the 2080s, said the study's author William Cline, a senior fellow at the Center for Global Development. India could see a drop of 30 to 40 per cent in its agricultural production, while poorer nations like Sudan and Senegal are projected to suffer by as much as a 56 per cent and 52 per cent respectively. On the other hand, rich countries in colder climes could experience an increase in productivity by up to eight per cent, according to the findings. Overall, agricultural productivity for the entire world is projected to decline by between 3 and 16 per cent by 2080s as a consequence of global warming. "Some analysts have suggested that a small amount of global warming could actually increase global agricultural productivity. My work shows that while productivity may increase in a minority of mostly northern countries, the global impact of climate change on agriculture will be negative by the second half of this century," Cline said. "There might be some initial overall benefit to warming for a decade or two but because future warming depends on greenhouse gas emissions today, if we delay action it would put global agriculture on an inexorable trajectory to serious damage," he said in a statement. Cline, who published his study in new book "Global Warming and Agriculture: Impact Estimates by Country", based his findings on climate models used by the Intergovernmental Panel on Climate Change (IPCC). Previous studies have provided regional estimates or country estimates for just a handful of countries.

### Warming outweighs – droughts kill fertilization

Hansen, ’10 – writer at Space Daily [Kathryn, 8/26/2010, Space Daily, “Drought Drives Decade-Long Decline in Plant Growth,” Lexis, DS]

Earth has done an ecological about-face: Global plant productivity that once flourished under warming temperatures and a lengthened growing season is now on the decline, struck by the stress of drought. NASA-funded researchers Maosheng Zhao and Steven Running, of the University of Montana in Missoula, discovered the global shift during an analysis of NASA satellite data. Compared with a six-percent increase spanning two earlier decades, the recent ten-year decline is slight, just one percent. The shift, however, could impact food security, biofuels, and the global carbon cycle. "We see this as a bit of a surprise, and potentially significant on a policy level because previous interpretations suggested that global warming might actually help plant growth around the world," Running said. "These results are extraordinarily significant because they show that the global net effect of climatic warming on the productivity of terrestrial vegetation need not be positive, as was documented for the 1980's and 1990's," said Diane Wickland, of NASA Headquarters and manager of NASA's Terrestrial Ecology research program. Conventional wisdom based on previous research held that land plant productivity was on the rise. A 2003 paper in Science led by then University of Montana scientist Ramakrishna Nemani (now at NASA Ames Research Center, Moffett Field, Calif.) showed that global terrestrial plant productivity increased as much as six percent between 1982 and 1999. That's because for nearly two decades, temperature, solar radiation and water availability, influenced by climate change, were favorable for growth. Setting out to update that analysis, Zhao and Running expected to see similar results as global average temperatures have continued to climb. Instead, they found that the impact of regional drought overwhelmed the positive influence of a longer growing season, driving down global plant productivity between 2000 and 2009. The team published their findings Aug. 20 in Science. "This is a pretty serious warning that warmer temperatures are not going to endlessly improve plant growth," Running said. The discovery comes from an analysis of plant productivity data from the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite, combined with growing season climate variables including temperature, solar radiation and water. The plant and climate data are factored into an algorithm that describes constraints on plant growth at different geographical locations. For example, growth is generally limited in high latitudes by temperature and in deserts by water. But regional limitations can very in their degree of impact on growth throughout the growing season. Zhao and Running's analysis showed that since 2000, high-latitude northern hemisphere ecosystems have continued to benefit from warmer temperatures and a longer growing season. But that effect was offset by warming-associated drought that limited growth in the southern hemisphere, resulting in a net global loss of land productivity. "This past decade's net decline in terrestrial productivity illustrates that a complex interplay between temperature, rainfall, cloudiness, and carbon dioxide, probably in combination with other factors such as nutrients and land management, will determine future patterns and trends in productivity," Wickland said. Researchers are keen on maintaining a record of the trends into the future. For one reason, plants act as a carbon dioxide "sink," and shifting plant productivity is linked to shifting levels of the greenhouse gas in the atmosphere. Also, stresses on plant growth could challenge food production. "The potential that future warming would cause additional declines does not bode well for the ability of the biosphere to support multiple societal demands for agricultural production, fiber needs, and increasingly, biofuel production," Zhao said. "Even if the declining trend of the past decade does not continue, managing forests and croplands for multiple benefits to include food production, biofuel harvest, and carbon storage may become exceedingly challenging in light of the possible impacts of such decadal-scale changes," Wickland said.

### High-magnitude warming tanks any benefit of fertilization

Stern 7 – Chair of the London School of Economics and Poli Sci [Nicholas, “The Economics of Climate Change: The Stern Review”, The report of a team commissioned by the British Government to study the economics of climate change led by Siobhan Peters, Head of G8 and International Climate Change Policy Unit, Cambridge University Press, www.mccormack.umb.edu/centers/nejpp/articles/21\_2/STERN.pdf]

Food production will be particularly sensitive to climate change, because crop yields depend in large part on prevailing climate conditions (temperature and rainfall patterns). Agriculture currently accounts for 24% of world output, employs 22% of the global population, and occupies 40% of the land area. 75% of the poorest people in the world (the one billion people who live on less than $1 a day) live in rural areas and rely on agriculture for their livelihood.29 Low levels of warming in mid to high latitudes (US, Europe, Australia, Siberia and some parts of China) may improve the conditions for crop growth by extending the growing season30 and/or opening up new areas for agriculture. Further warming will have increasingly negative impacts – the classic “hill function” (refer back to Box 3.1) - as damaging temperature thresholds are reached more often and water shortages limit growth in regions such as Southern Europe and Western USA.31 High temperature episodes can reduce yields by up to half if they coincide with a critical phase in the crop cycle like flowering (Figure 3.4).32 The impacts of climate change on agriculture depend crucially on the size of the “carbon fertilisation” effect (Box 3.4). Carbon dioxide is a basic building block for plant growth. Rising concentrations in the atmosphere may enhance the initial benefits of warming and even offset reductions in yield due to heat and water stress. Work based on the original predictions for the carbon fertilisation effect suggests that yields of several cereals (wheat and rice in particular) will increase for 2 or 3°C of warming globally, according to some models, but then start to fall once temperatures reach 3 or 4°C.33 Maize shows greater declines in yield with rising temperatures because its different physiology makes it less responsive to the direct effects of rising carbon dioxide. Correspondingly, world cereal production only falls marginally (1 – 2%) for warming up to 4°C (Box 3.4).34 But the latest analysis from crops grown in more realistic field conditions suggests that the effect is likely to be no more than half that typically included in crop models.35 When a weak carbon fertilisation effect is used, worldwide cereal production declines by 5% for a 2°C rise in temperature and 10% for a 4°C rise. By 4°C, entire regions may be too hot and dry to grow crops, including parts of Australia. Agricultural collapse across large areas of the world is possible at even higher temperatures (5 or 6°C) but clear empirical evidence is still limited.

### Climate change decimates agriculture – kills key resource supplies

Wahlquist, ‘9 – Rural writer for the Weekend Australian [Asa, Weekend Australian, “Climate change will cause grave world food shortages,” Lexis, DS]

Climate change is forecast to reduce wheat and rice yields, increasing prices and resulting in an additional 25 million malnourished children by 2050. A report by the Washington-based International Food Policy Research Institute says climate change will reduce irrigated wheat yields by 30 per cent in developing countries by 2050, pushing prices up by as much as 121 per cent. Irrigated rice yields are forecast to fall by 15 per cent and rice prices are expected to rise by up to 150 per cent. Even without climate change, the world faces a big shortfall in food by 2050 due to the growing world population and declining agricultural productivity. Mark Rosegrant from the institute says it is the first report that looks at the effects of climate change on agriculture, food prices, demand and trade. He says it was prepared for the climate change conference to be held in Copenhagen in December. He says agriculture is uniquely vulnerable to climate change. ``It is reliant on natural resources, temperature and water for its production.'' The study says South Asia, ``particularly India and Pakistan, is going to be very hard hit in terms of production impacts, as much as possibly 40 per cent declines in wheat production in those areas. That translates into very significant negative impacts on malnutrition in the region.'' Rosegrant says the other area to suffer would be sub-Saharan Africa, ``where the impact isn't quite a high as in Southeast Asia, but they are starting from very high levels of poverty and vulnerability''. The report is based partly on information from the CSIRO. CSIRO chief executive Megan Clark this week told the National Press Club in Canberra that the world's farmers will need to produce as much food in the next 50 years as has been produced in human history. Clark says food production is going to become one of the world's biggest concerns and Australia has a huge role to play. ``Humans have met this challenge once before: from 1960 to 2000, world food production doubled through a combination of new technology and investment,'' she says. ``But this time, two things are different. We can no longer simply clear more forest and farm even more marginal land. And secondly, this is happening at a time when we are seeing the greatest migration of our species to urban centres.'' Rosegrant says demand for food from developed countries such as Australia will become much greater. Last year, reduced world supplies of wheat and rice led to price rises, food riots and a number of countries restricting food exports. He says Australia must maintain its leadership in the fight for free trade. ``It willbe absolutely essential to help the systembecome more resilient in the face of climate change.'' The report says an additional $US7billion ($7.9bn) a year must be invested in increased agricultural productivity, to help farmers in developing countries adapt to climate change. ``The developed countries have to live up to their pledges at the recent G8, and now the G20, to increase investments in developing countries,'' Rosegrant says. He wants to get agriculture into the agreement that will be forged in Copenhagen: ``It didn't have a big role in Kyoto.'' Rosegrant would like to see increased investment in agriculture, and for agriculture to become ``part of any carbon trading mechanisms to come out of Copenhagen. It wasn't in Kyoto at all,'' he says.

## AT: CO2 Ag- Offense

### Turn – warming kills agriculture –

### A. Ozone depletion – our evidence is comparative

**Monbiot, ‘7** – Professor at Oxford [George, Heat: How to Stop the Planet from Burning, pg. 7]

But now, I am sorry to say, it seems that I might have been right, though for the wrong reasons. In late 2005, a study published in the Philosophical Transactions of the Royal Society alleged that the yield predictions for temperate countries were 'over optimistic'. The authors had blown carbon dioxide and ozone, in concentrations roughly equivalent to those expected later this century, over crops in the open air. They discovered that the plants didn't respond as they were supposed to: the extra carbon dioxide did not fertilize them as much as the researchers predicted, and the **ozone reduced their yields** by 20 per cent." Ozone levels are rising in the rich nations by between 1 and 2 per cent a year, as a result of sunlight interacting with pollution from cars, planes and power stations. The levels happen to be highest in the places where crop yields were expected to rise: western Europe, the midwest and eastern US and eastern China. The expected ozone increase in China will cause maize, rice and soybean production to fall by over 30 per cent by 2020, These reductions in yield, if real, arc enough to **cancel out the effects** of both higher temperatures and higher carbon dioxide concentrations.

### B. Pollinator deaths

Memmott et al, ‘7 - School of Biological Sciences at University of Bristol [J, PG Craze, NM Waser, MV Price; 8/2010, Ecology letters, “Global warming and the disruption of plant-pollinator interactions,” http://www.ncbi.nlm.nih.gov/pubmed/17594426, DS]

Anthropogenic climate change is widely expected to drive species extinct by hampering individual survival and reproduction, by reducing the amount and accessibility of suitable habitat, or by eliminating other organisms that are essential to the species in question. Less well appreciated is the likelihood that climate change will directly disrupt or eliminate mutually beneficial (mutualistic) ecological interactions between species even before extinctions occur. We explored the potential disruption of a ubiquitous mutualistic interaction of terrestrial habitats, that between plants and their animal pollinators, via climate change. We used a highly resolved empirical network of interactions between 1420 pollinator and 429 plant species to simulate consequences of the phenological shifts that can be expected with a doubling of atmospheric CO(2). Depending on model assumptions, phenological shifts reduced the floral resources available to 17-50% of all pollinator species, causing as much as half of the ancestral activity period of the animals to fall at times when no food plants were available. Reduced overlap between plants and pollinators also decreased diet breadth of the pollinators. The predicted result of these disruptions is the extinction of pollinators, plants and their crucial interactions.

### C. Weed growth – their genetic diversity will overwhelm crops

Ziska, ‘7 – PhD in Agriculture and principal investigator at United States Department of Agriculture  
Agricultural Research Service Alternate Crop and Systems Lab [Lewis, 2007, “Climate change impact on weeds” http://www.climateandfarming.org/pdfs/FactSheets/III.1Weeds.pdf, DS]

Weeds have a greater genetic diversity than crops. Consequently, if a resource (light, water, nutrients or carbon dioxide) changes within the environment, it is more likely that weeds will show a greater growth and reproductive response. It can be argued that many weed species have the C4 photosynthetic pathway and therefore will show a smaller response to atmospheric CO2 relative to C3 crops. However, this argument does not consider the range of available C3 and C4 weeds present in any agronomic environment. That is, at present, the U.S. has a total of 46 major crops; but, over 410 “troublesome” weed species (both C3 and C4) associated with those crops (Bridges 1992). Hence, if a C4 weed species does not respond, it is likely that a C3 weed species will. In addition, many growers recognize that the worst weeds for a given crop are similar in growth habit or photosynthetic pathway; indeed, they are often the same uncultivated or “wild” species, e.g. oat and wild oat, sorghum and shattercane, rice and red rice. To date, for all weed/crop competition studies where the photosynthetic pathway is the same, weed growth is favored as CO2 is increased (Table 1, Ziska and Runion, In Press). In addition to agronomic weeds, there is an additional category of plants that are considered “noxious” or “invasive” weeds. These are plants, usually non-native whose introduction results in wide-spread economic or environmental consequences (e.g. kudzu). Many of these weeds reproduce by vegetative means (roots, stolons, etc.) and recent evidence indicates that as a group, these weeds may show a strong response to recent increases in atmospheric CO2 (Ziska and George 2004). How rising CO2 would contribute to the success of these weeds in situ however, is still unclear. Overall, the data that are available on the response of weeds and changes in weed ecology are limited. Additional details, particularly with respect to interactions with other environmental variables (e.g. nutrient availability, precipitation and temperature) are also needed.

## AT: CO2 Ag- Prefer our ev

### Prefer our evidence – more recent studies that reflect field conditions

Mittelstaedt, ‘6 - Environment reporter at the Globe and Mail [Martin, The Globe and Mail, “Harvest yields global warning;

Greenhouse gases won't offer expected benefit, study shows,” Lexis, DS]

In the long list of worries over the possible negative consequences of global warming, agriculture has usually been one of the only bright spots, with most researchers confident that as the planet's climate heated up, crops would be relatively unaffected or might even increase. This optimistic view has been based on hundreds of laboratory experiments showing that crucial crops, such as wheat, corn and soybeans, when exposed to higher concentrations of carbon dioxide released through the burning of fossil fuels, respond much like they've been given an extra dose of fertilizer. The plants experience more robust growth and have sharply higher yields. These plant experiments, conducted mainly during the 1980s, led most researchers to forecast that the disruption global warming might cause to agriculture through changes in temperatures and precipitation patterns would be offset by improved crop yields, as plants thrived in a world with higher levels of carbon dioxide. But that rosy view, which has been incorporated into projections made by influential bodies such as the United Nations Intergovernmental Panel on Climate Change, may be unjustified, says a new research paper in the journal Science that found the beneficial effect of rising carbon-dioxide levels has been significantly overestimated. The paper, based on experiments using plants grown under actual field conditions rather than in the more controlled enclosures used for the earlier estimates, found that while most yields increase as the amount of carbon dioxide in the air rises, the benefits were only about half the amounts that led to optimism about the impact of global warming on farm output.

### Prefer recent models and better tech–

McCarthy, ‘5 - Environment editor at The Independent [Michael, 4/27/2005, The Independent, “Climate change poses threat to food supply, scientists say,” Lexis, DS]

Worldwide production of essential crops such as wheat, rice, maize and soya beans is likely to be hit much harder by global warming than previously predicted, an international conference in London has heard. The benefits of higher levels of the main greenhouse gas, carbon dioxide, will in fact be outweighed by the downsides of climate change, a Royal Society discussion meeting was told yesterday. It had been thought that the gas might act as a fertiliser to increase plant growth. Rising atmospheric temperatures, longer droughts and side-effects of both, such as higher levels of ground-level ozone gas, are likely to bring about a substantial reduction in crop yields in the coming decades, large-scale experiments have shown. The two-day meeting, entitled Food Crops in a Changing Climate, is focusing largely on tropical countries where most of the world's food is grown, and where people are most vulnerable to climate change. It is bringing together leading scientists in the fields of meteorology, climate science and agriculture to report on the latest research, including growing crops in experimental conditions in the open air that simulate advanced global warming. Previously, such experiments had taken place in closed chambers, and these had suggested that the 'fertilisation' effect of rising CO2 would offset the detrimental effects of rising temperatures and drought incidence on crop production. But, a new technology known as Face (Free-Air Concentration Enrichment) is allowing treatment of large areas of crop with elevated levels of CO2 and ozone, and these experiments have painted a very different picture. 'Growing crops much closer to real conditions has shown that increased levels of carbon dioxide in the atmosphere will have roughly half the beneficial effects previously hoped for in the event of climate change,' said Steve Long, from Illinois University. 'In addition, ground-level ozone, which is also predicted to rise but has not been extensively studied before, has been shown to result in a loss of photosynthesis and 20% yield loss. Both these results show that we need to seriously re-examine our predictions for future global food production, as they are likely to be far lower than previously estimated,' Professor Long said. Additionally, studies in the UK and Denmark show that just a few days of hot temperatures can severely reduce the yield of major food crops such as wheat, soya beans, rice and groundnuts, if they coincide with the flowering of these crops. These results suggest that there are particular thresholds above which crops become very vulnerable to climate change. On a more positive note, the meeting also highlighted new developments in forecasting techniques, the basis of which can act as early warning systems of famine. The techniques incorporate a climate prediction model with a model that simulates crop growth under varying environmental conditions.

## AT: Ice Age

### Defer aff – contradicting scientific claims mean it’s better to stop emissions while we still can

Spotts, ‘4 - staff writer of The Christian Science Monitor [Peter N. Spotts, staff writer of The Christian Science Monitor, “Ice age to warming - and back?” http://www.csmonitor.com/2004/0318/p13s01-sten.html Mar 18]

The Little Ice Age and "the 8,200-year event" are not exactly household terms. Once only a handful of climate scientists puzzled over these episodes of abrupt climate change. Now, the topic is getting close scrutiny from the Pentagon, the halls of Congress, and even Hollywood - where a disaster movie set for release in May depicts a sudden deep freeze. One reason for all the interest? While policymakers have worried long and hard about global warming, which might raise Earth's temperature 1.4 to 5.8 degrees C by century's end, a growing body of evidence suggests natural forces could just as easily plunge Earth's average temperatures downward. In the past, the planet's climate has changed 10 degrees in as little as 10 years. That may not sound like much. But the last time the planet was 10 degrees colder, it was still in an ice age. "There's the very real potential of the climate system changing dramatically and rapidly" in ways that lie outside modern human experience, says Mark Eakin, who heads the paleoclimatology program of the National Oceanic and Atmospheric Administration (NOAA). The possibility of a sudden freeze doesn't mean mankind can relax efforts to curb global warming, many scientists warn. Indeed, given the complexity of Earth's climate, human activities that spew greenhouse gases into the atmosphere may increase the potential for an abrupt cooling. For example: Regional and global climates have undergone quick and dramatic changes even after what would appear to be only gentle prodding by natural influences, Dr. Eakin says. In many cases, that prodding has been far less severe than the changes humans have wrought via industrial emissions of carbon dioxide. "In the absence of better knowledge, we have to assume that humans are making abrupt climate change more likely - not because humans are worse than nature, it's just because we're changing the system," says Richard Alley, a Penn State University paleoclimatologist. Dr. Alley led a 2002 National Research Council panel that examined abrupt climate change and laid out recommendations for research priorities and possible adaptation strategies.

### The uncertainty in predicting the ice age means you defer to short term implications

Revkin, 8environment reporter at the New York Times, 2008 [Andrew C, “Skeptics on Human Climate Impact Seize

on Cold Spell,” March 2, New York Times, http://www.nytimes.com/2008/03/02/science/02cold.html?\_r=1&ref=science&oref=slogin]

It may seem that human-driven global warming, although perhaps a disaster on the scale of centuries, may be a good thing in the long run if it fends off the next ice age awhile. But many climatologists note that the complex interplay of greenhouse gases, orbital shifts and other influences on climate remain poorly understood. In fact, some experts say, there is a chance that human-induced warming could shut down heat-toting ocean currents that keep northern latitudes warmer than they otherwise would be. The result could be a faster descent into glacial times instead of a delay.

### No impact – tech can solve the ice age

Hansen, ‘7 head of NASA Goddard Institute and professor of Environmental Sciences, Columbia University [James, 6/25/2007, “How Can We Avert Dangerous Climate Change?” delivered as a private citizen to the Select Committee on Energy Independence and Global Warming, United States House of Representatives, http://arxiv.org/pdf/0706.3720]

Thus the natural tendency today, absent humans, would be toward the next ice age, albeit the tendency would not be very strong because the eccentricity of the Earth’s orbit is rather small (0.017). However, another ice age will never occur, unless humans go extinct. Although orbital changes are the ‘pacemaker’ of the ice ages, the two mechanisms by which the Earth becomes colder in an ice age are reduction of the long-lived GHGs and increase of ice sheet area. But these natural mechanisms are now overwhelmed by human-made emissions, so GHGs are skyrocketing and ice is melting all over the planet. Humans are now in control of global climate, for better or worse. An ice age will never be allowed to occur if humans exist, because it can be prevented by even a ‘thimbleful’ of CFCs (chlorofluorocarbons), which are easily produced.

## AT: Ice Age- SBSP solves

**SSP key to weather mod- solves the coming ice age.**

**Collins and Autino 08** (Patrick, econ professor-Azabu University (Japan) and a Collaborating Researcher with the Institute for Space & Astronautical Science, and Adriano, President of the Space Renaissance International, “What the Growth of a Space Tourism Industry Could Contribute to Employment, Economic Growth, Environmental Protection, Education, Culture and World Peace, “http://www.spacefuture.com/archive/what\_the\_growth\_of\_a\_space\_tourism\_industry\_could\_contribute\_to\_employment\_economic\_growth\_environmental\_protection\_education\_culture\_and\_world\_peace.shtml)

4.4. Severe weather amelioration and climate stabilisation **The use of solar power satellites for reducing the severity of hurricanes and typhoons**, and/or ameliorating severe snow conditions **has been discussed** for some years. In the extreme case this **application of SSP might even include a role in the stabilisation of climate.** Earth's climate system is extremely complex, and is the subject of a great deal of ongoing scientific research, including collection of an ever-wider range of data, and ever-more detailed analysis of climate change in the past. **A positive-feedback cycle** causing sudden onset of the cooling phase of the long-term cycle **of "ice ages" has been hypothesized**, whereby a winter with unusually low temperatures and/or unusually widespread and/or longlasting snow cover would increase the probability of the following winter being even more severe [28,29]. The beginning of such a trend would be similar to the sharply more severe winters seen over the two last years in North America (as well as the unusually cool 2009 summer). Consequently, **although such a possibility may seem remote,** and although there are thorny legal problems concerning deliberate weather modification, it is nevertheless noteworthy that **satellite power stations may be the only practical means of selectively melting snow over areas of thousands of square kilometres**, possibly sufficient to prevent such a vicious circle, even in the event of terrestrial energy shortages.

## AT: Ice Age- Warming causes it

### Warming disrupts the ocean temperature cycles – leads to a short term ice age

Hartmann, ‘4 - Ph.D. from Brantridge in England [Thom, 1/30/2004, “How Global Warming May Cause the Next Ice Age...,” adapted from the new, updated edition of The Last Hours of Ancient Sunlight, by Thom Hartmann from Random House/Three Rivers Press, http://www.commondreams.org/views04/0130-11.htm]

While global warming is being officially ignored by the political arm of the Bush administration, and Al Gore's recent conference on the topic during one of the coldest days of recent years provided joke fodder for conservative talk show hosts, the citizens of Europe and the Pentagon are taking a new look at the greatest danger such climate change could produce for the northern hemisphere - a sudden shift into a new ice age. What they're finding is not at all comforting. In quick summary, if enough cold, fresh water coming from the melting polar ice caps and the melting glaciers of Greenland flows into the northern Atlantic, it will shut down the Gulf Stream, which keeps Europe and northeastern North America warm. The worst-case scenario would be a full-blown return of the last ice age - in a period as short as 2 to 3 years from its onset - and the mid-case scenario would be a period like the "little ice age" of a few centuries ago that disrupted worldwide weather patterns leading to extremely harsh winters, droughts, worldwide desertification, crop failures, and wars around the world. Here's how it works. If you look at a globe, you'll see that the latitude of much of Europe and Scandinavia is the same as that of Alaska and permafrost-locked parts of northern Canada and central Siberia. Yet Europe has a climate more similar to that of the United States than northern Canada or Siberia. Why? It turns out that our warmth is the result of ocean currents that bring warm surface water up from the equator into northern regions that would otherwise be so cold that even in summer they'd be covered with ice. The current of greatest concern is often referred to as "The Great Conveyor Belt," which includes what we call the Gulf Stream. The Great Conveyor Belt, while shaped by the Coriolis effect of the Earth's rotation, is mostly driven by the greater force created by differences in water temperatures and salinity. The North Atlantic Ocean is saltier and colder than the Pacific, the result of it being so much smaller and locked into place by the Northern and Southern American Hemispheres on the west and Europe and Africa on the east. As a result, the warm water of the Great Conveyor Belt evaporates out of the North Atlantic leaving behind saltier waters, and the cold continental winds off the northern parts of North America cool the waters. Salty, cool waters settle to the bottom of the sea, most at a point a few hundred kilometers south of the southern tip of Greenland, producing a whirlpool of falling water that's 5 to 10 miles across. While the whirlpool rarely breaks the surface, during certain times of year it does produce an indentation and current in the ocean that can tilt ships and be seen from space (and may be what we see on the maps of ancient mariners). This falling column of cold, salt-laden water pours itself to the bottom of the Atlantic, where it forms an undersea river forty times larger than all the rivers on land combined, flowing south down to and around the southern tip of Africa, where it finally reaches the Pacific. Amazingly, the water is so deep and so dense (because of its cold and salinity) that it often doesn't surface in the Pacific for as much as a thousand years after it first sank in the North Atlantic off the coast of Greenland. The out-flowing undersea river of cold, salty water makes the level of the Atlantic slightly lower than that of the Pacific, drawing in a strong surface current of warm, fresher water from the Pacific to replace the outflow of the undersea river. This warmer, fresher water slides up through the South Atlantic, loops around North America where it's known as the Gulf Stream, and ends up off the coast of Europe. By the time it arrives near Greenland, it's cooled off and evaporated enough water to become cold and salty and sink to the ocean floor, providing a continuous feed for that deep-sea river flowing to the Pacific. These two flows - warm, fresher water in from the Pacific, which then grows salty and cools and sinks to form an exiting deep sea river - are known as the Great Conveyor Belt. Amazingly, the Great Conveyor Belt is only thing between comfortable summers and a permanent ice age for Europe and the eastern coast of North America. Much of this science was unknown as recently as twenty years ago. Then an international group of scientists went to Greenland and used newly developed drilling and sensing equipment to drill into some of the world's most ancient accessible glaciers. Their instruments were so sensitive that when they analyzed the ice core samples they brought up, they were able to look at individual years of snow. The results were shocking. Prior to the last decades, it was thought that the periods between glaciations and warmer times in North America, Europe, and North Asia were gradual. We knew from the fossil record that the Great Ice Age period began a few million years ago, and during those years there were times where for hundreds or thousands of years North America, Europe, and Siberia were covered with thick sheets of ice year-round. In between these icy times, there were periods when the glaciers thawed, bare land was exposed, forests grew, and land animals (including early humans) moved into these northern regions. Most scientists figured the transition time from icy to warm was gradual, lasting dozens to hundreds of years, and nobody was sure exactly what had caused it. (Variations in solar radiation were suspected, as were volcanic activity, along with early theories about the Great Conveyor Belt, which, until recently, was a poorly understood phenomenon.) Looking at the ice cores, however, scientists were shocked to discover that the transitions from ice age-like weather to contemporary-type weather usually took only two or three years. Something was flipping the weather of the planet back and forth with a rapidity that was startling. It turns out that the ice age versus temperate weather patterns weren't part of a smooth and linear process, like a dimmer slider for an overhead light bulb. They are part of a delicately balanced teeter-totter, which can exist in one state or the other, but transits through the middle stage almost overnight. They more resemble a light switch, which is off as you gradually and slowly lift it, until it hits a mid-point threshold or "breakover point" where suddenly the state is flipped from off to on and the light comes on. It appears that small (less that .1 percent) variations in solar energy happen in roughly 1500-year cycles. This cycle, for example, is what brought us the "Little Ice Age" that started around the year 1400 and dramatically cooled North America and Europe (we're now in the warming phase, recovering from that). When the ice in the Arctic Ocean is frozen solid and locked up, and the glaciers on Greenland are relatively stable, this variation warms and cools the Earth in a very small way, but doesn't affect the operation of the Great Conveyor Belt that brings moderating warm water into the North Atlantic. In millennia past, however, before the Arctic totally froze and locked up, and before some critical threshold amount of fresh water was locked up in the Greenland and other glaciers, these 1500-year variations in solar energy didn't just slightly warm up or cool down the weather for the landmasses bracketing the North Atlantic. They flipped on and off periods of total glaciation and periods of temperate weather. And these changes came suddenly. For early humans living in Europe 30,000 years ago - when the cave paintings in France were produced - the weather would be pretty much like it is today for well over a thousand years, giving people a chance to build culture to the point where they could produce art and reach across large territories. And then a particularly hard winter would hit. The spring would come late, and summer would never seem to really arrive, with the winter snows appearing as early as September. The next winter would be brutally cold, and the next spring didn't happen at all, with above-freezing temperatures only being reached for a few days during August and the snow never completely melting. After that, the summer never returned: for 1500 years the snow simply accumulated and accumulated, deeper and deeper, as the continent came to be covered with glaciers and humans either fled or died out. (Neanderthals, who dominated Europe until the end of these cycles, appear to have been better adapted to cold weather than Homo sapiens.) What brought on this sudden "disappearance of summer" period was that the warm-water currents of the Great Conveyor Belt had shut down. Once the Gulf Stream was no longer flowing, it only took a year or three for the last of the residual heat held in the North Atlantic Ocean to dissipate into the air over Europe, and then there was no more warmth to moderate the northern latitudes. When the summer stopped in the north, the rains stopped around the equator: At the same time Europe was plunged into an Ice Age, the Middle East and Africa were ravaged by drought and wind-driven firestorms. . If the Great Conveyor Belt, which includes the Gulf Stream, were to stop flowing today, the result would be sudden and dramatic. Winter would set in for the eastern half of North America and all of Europe and Siberia, and never go away. Within three years, those regions would become uninhabitable and nearly two billion humans would starve, freeze to death, or have to relocate. Civilization as we know it probably couldn't withstand the impact of such a crushing blow. And, incredibly, the Great Conveyor Belt has hesitated a few times in the past decade. As William H. Calvin points out in one of the best books available on this topic ("A Brain For All Seasons: human evolution & abrupt climate change"): ".the abrupt cooling in the last warm period shows that a flip can occur in situations much like the present one. What could possibly halt the salt-conveyor belt that brings tropical heat so much farther north and limits the formation of ice sheets? Oceanographers are busy studying present-day failures of annual flushing, which give some perspective on the catastrophic failures of the past. "In the Labrador Sea, flushing failed during the 1970s, was strong again by 1990, and is now declining. In the Greenland Sea over the 1980s salt sinking declined by 80 percent. Obviously, local failures can occur without catastrophe - it's a question of how often and how widespread the failures are - but the present state of decline is not very reassuring." Most scientists involved in research on this topic agree that the culprit is global warming, melting the icebergs on Greenland and the Arctic icepack and thus flushing cold, fresh water down into the Greenland Sea from the north. When a critical threshold is reached, the climate will suddenly switch to an ice age that could last minimally 700 or so years, and maximally over 100,000 years. And when might that threshold be reached? Nobody knows - the action of the Great Conveyor Belt in defining ice ages was discovered only in the last decade. Preliminary computer models and scientists willing to speculate suggest the switch could flip as early as next year, or it may be generations from now. It may be wobbling right now, producing the extremes of weather we've seen in the past few years. What's almost certain is that if nothing is done about global warming, it will happen sooner rather than later.

### **Warming will cause an ice age – the ocean conveyor process is freezing up**

McGuire, ‘3 - Benfield Professor of Geophysical Hazards and director of the Benfield Hazard Research Centre at University College London [Bill, 11/13/2003, The Guardian, “Will global warming trigger a new ice age?” http://www.guardian.co.uk/environment/2003/nov/13/comment.research, DS]

If you can remember back to the bitter winters of the late 1970s and early 80s you might also recall that there was much discussion in scientific circles at the time about whether or not the freezing winter conditions were a portent of a new ice age. Over the past couple of decades such warnings have been drowned out by the great global warming debate and by consideration of how society might cope in future with a sweltering planet rather than an icebound one. Seemingly, the fact that we are still within an interglacial period, during which the ice has largely retreated to its polar fastnesses, has been forgotten - and replaced with the commonly-held view that one good thing you can say about global warming is that it will at least stave off the return of the glaciers. Is this really true, or could the rapidly accelerating warming that we are experiencing actually hasten the onset of a new ice age? A growing body of evidence suggests that, at least for the UK and western Europe, there is a serious risk of this happening - and soon. The problem lies with the ocean current known as the Gulf Stream, which bathes the UK and north-west Europe in warm water carried northwards from the Caribbean. It is the Gulf Stream, and associated currents, that allow strawberries to thrive along the Norwegian coast, while at comparable latitudes in Greenland glaciers wind their way right down to sea level. The same currents permit palms to flourish in Cornwall and the Hebrides, whereas across the ocean in Labrador, even temperate vegetation struggles to survive. Without the Gulf Stream, temperatures in the UK and north-west Europe would be five degrees centigrade or so cooler, with bitter winters at least as fierce as those of the so-called Little Ice Age in the 17th to 19th centuries. The Gulf Stream is part of a more complex system of currents known by a number of different names, of which the rather cumbersome North Atlantic Meridional Overturning Circulation (Namoc) is probably the most apt. This incorporates not only the Gulf Stream but also the cold return currents that convey water southwards again. As it approaches the Arctic, the Gulf Stream loses heat and part of it heads back to warmer climes along the coast of Greenland and eastern Canada in the form of the cold, iceberg-laden current responsible for the loss of the Titanic. Much, however, overturns - cooling and sinking beneath the Nordic seas between Norway and Greenland, before heading south again deep below the surface. In the past, the slowing of the Gulf Stream has been intimately linked with dramatic regional cooling. Just 10,000 years ago, during a climatic cold snap known as the Younger Dryas, the current was severely weakened, causing northern European temperatures to fall by as much as 10 degrees. Ten thousand years before that, at the height of the last ice age, when most of the UK was reduced to a frozen wasteland, the Gulf Stream had just two-thirds of the strength it has now. What's worrying is that for some years now, global climate models have been predicting a future weakening of the Gulf Stream as a consequence of global warming. Such models visualise the disruption of the Namoc, including the Gulf Stream, as a result of large-scale melting of Arctic ice and the consequent pouring of huge volumes of fresh water into the North Atlantic, in a century or two. New data suggest, however, that we may not have to wait centuries, and in fact the whole process may be happening already. So that the warm, saline surface waters of the Gulf Stream can continue to push northwards, there must be a comparable, deep return current of cold, dense water from the Nordic seas. Disturbingly, this return current seems to have been slowing since the middle of the last century. Bogi Hansen at the Faroese fisheries laboratory, and colleagues in Scotland and Norway, have been monitoring the deep outflow of cold water from the Nordic seas as it passes over the submarine Greenland-Scotland ridge that straddles the North Atlantic at this point. Their results show that the outflow has fallen by 20% since 1950, which suggests a comparable reduced inflow from the Gulf Stream. Although there is as yet no direct substantiation of this, and his colleagues point to reports of the cooling and freshening of the Norwegian Sea and to temperatures that are already falling in parts of the region as possible evidence of contemporary Gulf Stream weakening. It also seems that it is not only the intensity of the outflow of cold water that is changing. Bob Dickson of the Centre for Environment, Fisheries, and Aquaculture Science at Lowestoft, and colleagues, have reported a sustained and widespread freshening of returning deep waters south of the Greenland-Scotland ridge, which appears to have been going on for the past three or four decades. Already the freshening is extending along the North American eastern seaboard towards the equator, in the so-called Deep Western Boundary current. One of the scariest aspects of the current dramatic changes occurring in the system of North Atlantic currents is that the deep, southward-flowing limb of the Namoc can be thought of as representing the headwaters of the worldwide system of ocean currents known as the Global Thermohaline Circulation. The possibility exists, therefore, that a disruption of the Atlantic currents might have implications far beyond a colder UK and north-west Europe, perhaps bringing dramatic climatic changes to the entire planet. Yet again, this highlights the fact that global warming, for which we have only ourselves to thank, is nothing more nor less than a great planetary experiment, many of the outcomes of which we cannot predict. Wallace Broecker, an ocean circulation researcher at New York's Lamont-Doherty Earth observatory, described the situation perfectly when he pointed out that "climate is an angry beast and we are poking at it with sticks". Let's hope that when it truly turns on us, its teeth don't match its outrage.

## AT: Ice Age- Timeframe

### Let’s be serious – the ice age cycle comes back in 10,000 years

Chameides, ‘8 - Dean/Environmental Prof at Nicholas School at Duke University [Bill, 8/27/2008, “Did Climate Scientists Flip Flop?” Duke Environment at the Nicholas School, http://www.nicholas.duke.edu/thegreengrok/cooling, DS]

The Earth’s climate for the past 2 million years has been characterized by ice ages lasting 100,000 years or so, punctuated by warm periods (or “interglacials”) lasting tens of thousands of years. We have a pretty good understanding of the causes of these climate swings: changes in the Earth’s orbit around the sun amplified by natural feedbacks involving greenhouse gases. The Earth entered the present interglacial about 10,000 years ago. All things being equal (i.e., in the absence of a large human-produced source of the heat-trapping gas carbon dioxide [CO2]), it is almost certain that the Earth will swing back into another ice age. But this will not occur for tens of thousands of years. As early as the 19th century, scientists recognized that greenhouse gases warm the planet, and increases in atmospheric CO2 could lead to global warming on time scales of decades to centuries — much shorter than the fluctuations related to ice ages and interglacials. Around the same time, global temperatures began to rise and scientists became increasingly concerned that people were interfering with the climate.

## AT: Ice Age- Probability

### We’re on the brink – best models prove high probability without fast action

ScienceDaily, ‘5 [ScienceDaily, 12/7/2005, “Global Warming Could Halt Ocean Circulation, With Harmful Results,” http://www.sciencedaily.com/releases/2005/12/051207180807.htm#, DS]

Absent any climate policy, scientists have found a 70 percent chance of shutting down the thermohaline circulation in the North Atlantic Ocean over the next 200 years, with a 45 percent probability of this occurring in this century. The likelihood decreases with mitigation, but even the most rigorous immediate climate policy would still leave a 25 percent chance of a thermohaline collapse. "This is a dangerous, human-induced climate change," said Michael Schlesinger, a professor of atmospheric sciences at the University of Illinois at Urbana-Champaign. "The shutdown of the thermohaline circulation has been characterized as a high-consequence, low-probability event. Our analysis, including the uncertainties in the problem, indicates it is a high-consequence, high-probability event." Schlesinger will present a talk "Assessing the Risk of a Collapse of the Atlantic Thermohaline Circulation" on Dec. 8 at the United Nations Climate Control Conference in Montreal. He will discuss recent work he and his colleagues performed on simulating and understanding the thermohaline circulation in the North Atlantic Ocean. The thermohaline circulation is driven by differences in seawater density, caused by temperature and salinity. Like a great conveyor belt, the circulation pattern moves warm surface water from the southern hemisphere toward the North Pole. Between Greenland and Norway, the water cools, sinks into the deep ocean, and begins flowing back to the south. "This movement carries a tremendous amount of heat northward, and plays a vital role in maintaining the current climate," Schlesinger said. "If the thermohaline circulation shut down, the southern hemisphere would become warmer and the northern hemisphere would become colder. The heavily populated regions of eastern North America and western Europe would experience a significant shift in climate." Higher temperatures caused by global warming could add fresh water to the northern North Atlantic by increasing the precipitation and by melting nearby sea ice, mountain glaciers and the Greenland ice sheet. This influx of fresh water could reduce the surface salinity and density, leading to a shutdown of the thermohaline circulation. "We already have evidence dating back to 1965 that shows a drop in salinity around the North Atlantic," Schlesinger said. "The change is small, compared to what our model needs to shut down the thermohaline, but we could be standing at the brink of an abrupt and irreversible climate change." To analyze the problem, Schlesinger and his colleagues first used an uncoupled ocean general circulation model and a coupled atmosphere-ocean general circulation model to simulate the present-day thermohaline circulation and explore how it would behave in response to the addition of fresh water. They then used an extended, but simplified, model to represent the wide range of behavior of the thermohaline circulation. By combining the simple model with an economic model, they could estimate the likelihood of a shutdown between now and 2205, both with and without the policy intervention of a carbon tax on fossil fuels. The carbon tax started out at $10 per ton of carbon (about five cents per gallon of gasoline) and gradually increased. "We found that there is a 70 percent likelihood of a thermohaline collapse, absent any climate policy," Schlesinger said. "Although this likelihood can be reduced by the policy intervention, it still exceeds 25 percent even with maximal policy intervention." Because the risk of a thermohaline collapse is unacceptably large, Schlesinger said, "measures over and above the policy intervention of a carbon tax -- such as carbon capture and sequestration -- should be given serious consideration."

## AT: SO2 Screw

### Dimming low now

Westerly Sun 10 [Earth Talk, 12-2010, “Global dimming a result of pollution,” http://www.thewesterlysun.com/news/article\_f919852a-039e-11e0-8702-001cc4c03286.html]

Columbia University climatologist Beate Liepert notes a reduction by some 4 percent of the amount of solar radiation reaching the Earth's surface between 1961 and 1990, a time when particulate emissions began to skyrocket around the world. But a 2007 study by the National Aeronautics and Space Administration found an overall reversal of global dimming since 1990, probably due to stricter pollution standards adopted by the U.S. and Europe around that time.

### Warming outweighs dimming

Reynolds 10 – PhD in Atmospheric Sciences [Michael, Around the Americas, “Report from the On-board Scientist: Aerosols, Volcanoes and Global Dimming,” http://www.aroundtheamericas.org/log/report-from-the-on-board-scientist-aerosols-volcanoes-and-global-dimming/]

On the other hand, aerosols can add heat to the atmosphere which partially offsets the cooling effect. As the Earth heats up from the sun, it radiates heat back to space. Aerosols absorb some of the heat radiation and reduce the amount of heat radiation escaping out to space. This is the same heat-blocking effect attributed to greenhouse gasses, and in this way aerosols can have a heating effect on global climate. Nevertheless, the net effect of aerosols is to reduce the rate of global warming from greenhouse gasses. Does this mean we should all go build fires and drive our cars? No, because the offset that aerosols make on all of all these activities is **smaller than the impact those activities make on global warming.** Models and data now show that aerosols reduce the increase in global temperature by a factor of approximately 50% (there is uncertainty in the actual amount). So, they slow down the process but do not stop it. And they create pollution and effect health at the same time.

## \*\*\* Warming = Anthropogenic\*\*\*

## CO2 Key

### **CO2 is the root cause of warming – linear relationship proven**

ScienceDaily, ‘9 – [6/11/2009, Science Daily, “Carbon Emissions Linked to Global Warming in Simple Linear Relationship,” http://www.sciencedaily.com/releases/2009/06/090610154453.htm, DS]

Damon Matthews, a professor in Concordia University’s Department of Geography, Planning and the Environment has found a direct relationship between carbon dioxide emissions and global warming. Matthews, together with colleagues from Victoria and the U.K., used a combination of global climate models and historical climate data to show that there is a simple linear relationship between total cumulative emissions and global temperature change. These findings will be published in the next edition of Nature, to be released on June 11, 2009. Until now, it has been difficult to estimate how much climate will warm in response to a given carbon dioxide emissions scenario because of the complex interactions between human emissions, carbon sinks, atmospheric concentrations and temperature change. Matthews and colleagues show that despite these uncertainties, each emission of carbon dioxide results in the same global temperature increase, regardless of when or over what period of time the emission occurs. These findings mean that we can now say: if you emit that tonne of carbon dioxide, it will lead to 0.0000000000015 degrees of global temperature change. If we want to restrict global warming to no more than 2 degrees, we must restrict total carbon emissions – from now until forever – to little more than half a trillion tonnes of carbon, or about as much again as we have emitted since the beginning of the industrial revolution. “Most people understand that carbon dioxide emissions lead to global warming,” says Matthews, “but it is much harder to grasp the complexities of what goes on in between these two end points. Our findings allow people to make a robust estimate of their contribution to global warming based simply on total carbon dioxide emissions.” In light of this study and other recent research, Matthews and a group of international climate scientists have written an open letter calling on participants of December’s Conference of the Parties to the U.N. Framework Convention on Climate Change to acknowledge the need to limit cumulative emissions of carbon dioxide so as to avoid dangerous climate change.

## AT: Water Vapor More

### CO2’s the root cause – water vapor’s irrelevant

BBC, ‘7 [British Broadcasting Corporation, 11/12/07, “Climate onizingm: The top 10,” http://news.bbc.co.uk/2/hi/in\_depth/629/629/7074601.stm, DS]

Sceptic The natural greenhouse effect keeps the Earth’s surface about 33C warmer than it would otherwise be. Water vapour is the most important greenhouse gas, accounting for about 98% of all warming. So changes in carbon dioxide or methane concentrations would have a relatively small impact. Water vapour concentrations are rising, but this does not necessarily increase warming – it depends how the water vapour is distributed. Counter Water vapour is essentially in balance with the planet’s temperature on annual timescales and longer, whereas trace greenhouse gases such as CO2 stay in the atmosphere on a timescale of decades to centuries. The statement that water vapour is “98% of the greenhouse effect” is simply false. In fact, it does about 50% of the work; clouds add another 25%, with CO2 and the other greenhouse gases contributing the remaining quarter. Water vapour concentrations are increasing in response to rising temperatures, and there is evidence that this is adding to warming, for example in Europe. The fact that water vapour is a feedback is included in all climate models.

### Water vapor’s a positive feedback – residence time proves

RealClimate, ‘5 – online climate scientist discussion/information page [4/6/2005, http://www.realclimate.org/index.php/archives/2005/04/water-vapour-feedback-or-forcing/, DS]

While water vapour is indeed the most important greenhouse gas, the issue that makes it a feedback (rather than a forcing) is the relatively short residence time for water in the atmosphere (around 10 days). To demonstrate how quickly water reacts, I did a GCM experiment where I removed all the water in the atmosphere and waited to see how quickly it would fill up again (through evaporation from the ocean) . The result is shown in the figure. It’s not a very exciting graph because the atmosphere fills up very quickly. At Day 0 there is zero water, but after only 14 days, the water is back to 90% of its normal value, and after 50 days it’s back to within 1%. That’s less than 3 months. Compared to the residence time for perturbations to CO2 (decades to centuries) or CH4 (a decade), this is a really short time.

## AT: Solar Variations

### Solar variations don’t cause warming – actually causes slight cooling

ScienceDaily, ’10 – [10/7/2010, ScienceDaily, “Decline in Sun’s Activity Does Not Always Mean That Earth Becomes Cooler, Study Shows,” http://www.sciencedaily.com/releases/2010/10/101006141558.htm, DS]

The Sun’s activity has recently affected Earth’s atmosphere and climate in unexpected ways, according to a new study published in the journal Nature. The study, by researchers from Imperial College London and the University of Colorado, shows that a decline in the Sun’s activity does not always mean that Earth becomes cooler. It is well established that the Sun’s activity waxes and wanes over an 11-year cycle and that as its activity wanes, the overall amount of radiation reaching Earth decreases. This latest study looked at the Sun’s activity over the period 2004-2007, when it was in a declining part of its 11-year activity cycle. Although the Sun’s activity declined over this period, the new research shows that it may have actually caused Earth to become warmer. Contrary to expectations, the amount of energy reaching Earth at visible wavelengths increased rather than decreased as the Sun’s activity declined, causing this warming effect. Following this surprising finding, the researchers behind the study believe it is possible that the inverse is also true and that in periods when the Sun’s activity increases, it tends to cool, rather than warm, Earth. This is based on what is already known about the relationship between the Sun’s activity and its total energy output. Overall solar activity has been increasing over the past century, so the researchers believe it is possible that during this period, the Sun has been contributing a small cooling effect, rather than a small warming effect as had previously been thought.

## AT: Solar Variations (Mars)

### Mars doesn’t prove solar variation – orbital wobbles cause climate shift

Ravilious, ‘7 – reporter for National Geographic News [Kate, 2/28/2007, National Geographic News, “Mars Melt Hints at Solar, Not Human, Cause for Warming, Scientist Says,” http://news.nationalgeographic.com/news/55741367.html, DS]

Abdussamatov believes that changes in the sun’s heat output can account for almost all the climate changes we see on both planets. Mars and Earth, for instance, have experienced periodic ice ages throughout their histories. “Man-made greenhouse warming has made a small contribution to the warming seen on Earth in recent years, but it cannot compete with the increase in solar irradiance,” Abdussamatov said. By studying fluctuations in the warmth of the sun, Abdussamatov believes he can see a pattern that fits with the ups and downs in climate we see on Earth and Mars. Abdussamatov’s work, however, has not been well received by other climate scientists. “His views are completely at odds with the mainstream scientific opinion,” said Colin Wilson, a planetary physicist at England’s Oxford University. “And they contradict the extensive evidence presented in the most recent IPCC [Intergovernmental Panel on Climate Change] report.” (Related: “Global Warming ‘Very Likely’ Caused by Humans, World Climate Experts Say” [February 2, 2007].) Amato Evan, a climate scientist at the University of Wisconsin, Madison, added that “the idea just isn’t supported by the theory or by the observations.” Planets’ Wobbles The conventional theory is that climate changes on Mars can be explained primarily by small alterations in the planet’s orbit and tilt, not by changes in the sun. “Wobbles in the orbit of Mars are the main cause of its climate change in the current era,” Oxford’s Wilson explained. (Related: “Don’t Blame Sun for Global Warming, Study Says” [September 13, 2006].) All planets experience a few wobbles as they make their journey around the sun. Earth’s wobbles are known as Milankovitch cycles and occur on time scales of between 20,000 and 100,000 years. These fluctuations change the tilt of Earth’s axis and its distance from the sun and are thought to be responsible for the waxing and waning of ice ages on Earth. Mars and Earth wobble in different ways, and most scientists think it is pure coincidence that both planets are between ice ages right now. “Mars has no [large] moon, which makes its wobbles much larger, and hence the swings in climate are greater too,” Wilson said. No Greenhouse Perhaps the biggest stumbling block in Abdussamatov’s theory is his dismissal of the greenhouse effect, in which atmospheric gases such as carbon dioxide help keep heat trapped near the planet’s surface. He claims that carbon dioxide has only a small influence on Earth’s climate and virtually no influence on Mars. But “without the greenhouse effect there would be very little, if any, life on Earth, since our planet would pretty much be a big ball of ice,” said Evan, of the University of Wisconsin. Most scientists now fear that the massive amount of carbon dioxide humans are pumping into the air will lead to a catastrophic rise in Earth’s temperatures, dramatically raising sea levels as glaciers melt and leading to extreme weather worldwide.

## AT: Cosmic Rays

### Cosmic rays can’t explain current warming – doesn’t cause cloud cover

Pearce and LePage, ‘7 – foremost British environment writer and writer for the New Scientist [Fred and Michael, 5/16/2007, New Scientist, “Climate myths: It’s all down to cosmic rays,” http://www.newscientist.com/article/dn11651-climate-myths-its-all-down-to-cosmic-rays.html?full=true, DS]

It has been claimed that the amount of cloud cover – and hence global temperature – depends on cosmic ray intensity but neither satellite records nor computer models support this. The variation in the total amount of energy reaching Earth from the Sun is one of the main factors determining our planet’s climate (see Climate myths: Global warming is down to the Sun, not humans). However, this factor alone cannot explain the recent warming nor, indeed, can it fully explain many past changes such as Earth’s ice ages. But what if changes in the Sun’s activity have larger-than-expected effects on the climate? There are plenty of ideas about how this could happen. For instance, one as-yet-unproven idea is that changes in the relative amount of ultraviolet light emitted by the Sun might affect the ozone layer, heating the stratosphere and altering circulation patterns in the lower atmosphere. In the late 1990s, some Danish scientists revived another idea, proposed decades earlier, that cosmic rays might be able to amplify small changes in solar activity by onizing the atmosphere and triggering cloud formation. Chilling idea Increased sunspot activity is known to strengthen the Sun’s magnetic field, which deflects more of the galactic cosmic rays entering the solar system and thus reducing the number hitting Earth. The argument championed by Henrik Svensmark is that this would reduce cloud formation in the atmosphere – warming the Earth – and that this effect explains the recent global warming. The case has been made at greater length in a book Svensmark wrote with science journalist Nigel Calder (who edited New Scientist from 1962 to 1966), called The Chilling Stars. There are at least three separate issues here. First, do cosmic rays really trigger cloud formation? If so, how do the resulting changes in cloud cover affect temperature? Finally, does this explain the warming trend of the past few decades? Far-fetched concept There is no convincing evidence that cosmic rays are a major factor determining cloud cover. The onizing of air by cosmic rays will impart an electric charge to aerosols, which in theory could encourage them to clump together to form particles large enough for cloud droplets to form around, called “cloud condensation nuclei”. But cloud physicists say it has yet to be shown that such clumping occurs. And even if it does, it seems far-fetched to expect any great effect on the amount of clouds in the atmosphere. Most of the atmosphere, even relatively clean marine air, has plenty of cloud condensation nuclei already. A series of attempts by Svensmark to show an effect have come unstuck. Initially, Svensmark claimed there was a correlation between cosmic ray intensity and satellite measurements of total cloud cover since the 1980s – yet a correlation does not prove cause and effect. It could equally well reflect changes in solar irradiance, which inversely correlate with cosmic ray intensity. Furthermore, this apparent correlation depended on adjustments to the data, and it does not hold up when more recent cloud measurements from 1996 onwards are included. Beguiling fit Svensmark and others then pointed to an apparent correlation between low-altitude cloud cover and cosmic rays. But after 1995, the beguiling fit of Svensmark’s graph depends on a “correction” of satellite data, and the satellite scientists say this is not justified. “It’s dubious manipulation of data in order to suit his hypothesis,” says Joanna Haigh, an atmospheric physicist at Imperial College London, UK. Then there is the question of how changes in clouds will affect climate. Svensmark claims the overall effect of less cloud cover is a warmer world, with less heat loss due to reflection off clouds during the day outweighing higher loss of heat at night. Yet even during the day, many clouds in the upper atmosphere can have a warming effect. Not all scientists agree that reducing cloud cover would warm the planet. In fact, clouds are one of the greatest uncertainties in climate science. It is not even clear whether the satellite measurements of changes in cloudiness are correct or how these changes have affected temperature, let alone what will happen in the future. Clouds might mitigate global warming or amplify it. No trend Finally, and most importantly, even if cosmic ray intensity does turn out to influence cloud cover and temperature, it cannot explain the warming trend of the past few decades. Direct measurements of cosmic ray intensity going back as far as 50 years show no downward trend coinciding with the recent warming. Indirect measurements of cosmic rays, based on the abundance of certain atmospheric isotopes formed by them, suggest that intensity fell between 1900 and 1950. Yet while there can be a lag between a sudden jump in a climate “forcing” and its full effect on temperature, most warming should occur within a few years and taper off within decades.. The wild claims of Svensmark do not mean that the idea of a link between cosmic rays and clouds is nonsense. It is taken seriously by a small number of scientists. A handful of studies using different methods hint at a very tiny effect, though more have found none. Experiments now underway at the European Laboratory for Particle Physics (CERN) should settle the issue of whether cosmic rays can trigger the formation of cloud condensation nuclei, though this will not reveal whether it matters in the real world. The bottom line is that whether or not cosmic rays have affected the climate in the more distant past, they cannot explain our planet’s recent warming. Update: several groups are now creating much more sophisticated computer models of cloud formation. So far, these models suggest that the effect of cosmic rays are “far too small to make noticeable changes in cloud properties”.

## AT: Milankovitch Cycles

### Human influence outweighs Milankovitch cycle – emissions reversed projected cooling

Biello, ‘9 – [David, 9/04/2009, Scientific American, “Global Warming Reverses Long-Term Arctic Cooling,” http://www.scientificamerican.com/article.cfm?id=global-warming-reverses-arctic-cooling, DS]

Based on its long-term orbit, Earth should be heading into an ice age. But instead of continuing to cool—as it had been for at least the past 2,000 years—the Arctic has started to warm. And the reason is humans’ impact on the composition of the atmosphere, new research suggests. To look at this trend, geologist Darrell Kaufman of Northern Arizona University and a consortium of colleagues reconstructed Arctic temperatures decade by decade over the past two millennia by pulling sediment cores from the bottoms of 14 Arctic lakes—backed up by records in tree rings and ice cores.  In warm summers, relatively more sediment is deposited thanks to more meltwater from the glaciers that create these lakes, and the abundance of algae in the sediment layers reveals the length of growing seasons. So, these sediment cores provide a picture of the climate that goes back millennia. The record they reveal is of a cooling pole. As the Earth has moved slightly further away from the sun due to vagaries in its orbit—it’s roughly 600,000 miles further away now than in 1 C.E.—some parts of the Arctic received as much as 6 watts per meter squared less sunlight than in 1 C.E. That, in turn, has led to a cooling rate of roughly 0.2 degrees Celsius per 1,000 years. But at some point in the 20th century, that trend stopped and reversed. “Orbitally driven summer insolation continued to decrease through the 20th century, implying that summer temperatures should have continued to cool,” the researchers wrote this week in the September 4 edition of Science. “Instead, the shift to higher temperatures during the 20th century reversed the millennial scale cooling trend.” In the past decade, summertime Arctic temperatures have been 1.4 degrees Celsius higher on average than would be expected and 1.2 degrees Celsius higher than in 1900. And the Arctic is merely the trendsetter—the northern-most latitudes are among the fastest-warming parts of the globe due to various feedbacks. For example, melting Arctic sea ice exposes more ocean, which in turn absorbs more of the sunlight’s warmth and further increases warming. A graph of the warming trend largely replicates the so-called “hockey stick,” a previous reconstruction that showed relatively stable temperatures suddenly spiking upward in recent history. It also accurately reveals the impact of historical climate events like the Little Ice Age, which took place from the 17th to 19th centuries. Without greenhouse gas emissions in the atmosphere, a true ice age might have been expected as a 21,000-year wobble in Earth’s tilt relative to the sun that shifts the intensity of sunlight. That cooling trend wouldn’t have reversed naturally for ­at least another 4,000 years. Yet, despite this decline, Arctic temperatures have soared and the most likely culprit is the build-up of greenhouse gases in the atmosphere from fossil fuel burning, forest clearing and other human activity, Kaufmann and his colleagues wrote. “The most recent 10-year interval (1999–2008) was the warmest of the past 200 decades,” they wrote. “Temperatures were about 1.4 degrees C higher than the projected values based on the linear cooling trend and were even more anomalous than previously documented.” Of course, summer temperatures when the warming portion of the wobble cycle peaked roughly 7,500 years ago were at least 0.8 degrees Celsius warmer than 20th-century average temperatures. Nonetheless, this current, countercyclical warming trend will likely continue—potentially exceeding that earlier warming—unlessgreenhouse gas levels begin to come back down. In the meantime, polar denizens adapted for the cooler climate can blame humanity for a balmier Arctic.

## AT: El Nino

### El Nino can’t explain warming – your authors misfiltered data

Cook, ’10 – Citing Penn State Metereology Professor, Professor of Environmental Science at Auckland University, and Climatic Researcher at University of East Anglia in UK [John, 3/18/2010, “A peer-reviewed response to McLean’s El Nino paper,” Skeptical Science, http://www.skepticalscience.com/peer-reviewed-response-to-mclean-el-nino-paper.html]

A paper published mid-2009 claimed a link between global warming and the El Nino Southern Oscillation (ENSO) (McLean et al 2009). According to one of its authors, Bob Carter, the paper found that the “close relationship between ENSO and global temperature, as described in the paper, leaves little room for any warming driven by human carbon dioxide emissions”. This result is in strong contrast with two decades of peer-reviewed research which find ENSO has little influence on long-term trends. Why the discrepancy? A response has now been accepted for publication in the Journal of Geophysical Research (Foster et al 2010) explaining why McLean 2009 differs from the body of peer-reviewed research. First, let’s examine how McLean et al arrived at their conclusion. They compared both weather balloon (RATPAC) and satellite (UAH) measurements of tropospheric temperature to El Niño activity (SOI). To remove short-term noise, they plotted a 12 month running average of Global Tropospheric Temperature Anomaly (GTTA, the light grey line) and the Southern Oscillation Index (SOI, the black line). Figure 1: Twelve-month running means of SOI (dark line) and MSU GTTA (light line) for the period 1980 to 2006 with major periods of volcanic activity indicated (McLean 2009). The Southern Oscillation Index shows no long term trend while the temperature record shows a long-term warming trend. Consequently, McLean et al found only a weak correlation between temperature and SOI. Next, they applied another filter to the data by subtracting the 12 month running average from the same average 1 year later. The comparison between the filtered data for El Nino and Temperature are as follows: Figure 2: Derivatives of SOI (dark line) and MSU GTTA (light line) for the period 1981–2007 after removing periods of volcanic influence (McLean 2009). From this close correlation, McLean et al argued that more than two thirds of interseasonal and long-term variability in temperature changes can be explained by the Southern Oscillation Index. This result contradicts virtually every other study into the connection between ENSO and temperature variability, particularly with regard to long-term warming trends. Past analyses have found ENSO was responsible for 15 to 30% of interseasonal variability but little of the global warming trend over the past half century (Jones 1989, Wigley 2000, Santer 2001, Trenberth 2002, Thompson 2008). Why does McLean come to a different result? This question is examined in Comment on “Influence of the Southern Oscillation on tropospheric temperature” by J. D. McLean, C. R. de Freitas, and R. M. Carter (Foster et al 2010). Foster et al examine the filtering process that McLean et al applied to the temperature and ENSO data. This filtering has two steps – they take 12-month moving averages then take the differences between those values which are 12 months apart. The first step filters the high-frequency variation from the time series while the second step filters low-frequency variation. The problem with the latter step is it removes any long-term trends from the original temperature data. The long-term warming trend in the temperature record is where the disagreement between temperature and ENSO is greatest. Why do McLean et al remove the long-term trend? They justify it by noting a lack of correlation between SOI and GTTA, speculating that the derivative filter might remove noise caused by volcanoes or wind. However, taking the derivative of a time series does not remove, or even reduce, short-term noise. It has the opposite effect, amplifying the noise while removing longer-term changes. To further illustrate how the filtering process increases the correlation between SOI and temperature, the authors construct an artificial “temperature” time series as -0.02 times the SOI time series. They then add white noise and a linear trend. This has the effect of creating a temperature time series with a long term warming trend. The correlation between the raw artificial temperature series and the SOI series is very low (R2 = 0.0161). However, when the McLean et al filters are applied to both time series, the correlation is now very high (R2 = 0.8295). This is because the filtering removes low frequency elements such as the long term warming trend. Figure 3: (a) Southern Oscillation Index (SOI) data (black) versus artificial data proportional to the SOI, and with normally-distributed white noise and a sinusoidal signal added (red). (b): Filtered versions (using the McLean et al procedure) of the series in (a). Despite the extreme distorting effect of their filter, McLean et al consistently refer to the correlations as between SOI and tropospheric temperature. They draw no attention to the fact that the correlations are between heavily filtered time series. This failure causes what is essentially a mistaken result to be misinterpreted as a direct relationship between important climate variables. Another interesting feature of McLean et al 2009 is a plot of unfiltered temperature data (GTTA) against the Southern Oscillation Index (SOI) to illustrate the quality of the match between them. However the temperature signal is a splice of weather balloon data (RATPAC-A) to the end of 1979 followed by satellite data (UAH TLT) since 1980. RATPAC-A data show a pronounced warming trend from 1960 to 2008 with the temperature line rising away from the SOI line. This warming trend is obscured by substituting the weather balloon data with satellite data after 1980. It is especially misleading because the mean values of RATPAC-A and UAH TLT data during their period of overlap differ by nearly 0.2 K. Splicing them together introduces an artificial 0.2-degree temperature drop at the boundary between the two. Unfortunately, the splicing is obscured by the fact that the graph is split into different panels precisely at the splicing boundary. This splicing + graph splitting technique is an effective way to “hide the incline” of the warming trend. Figure 4: Seven-month shifted SOI with (a) weather balloon RATPAC-A temperature data 1958–1979 and satellite UAH temperature data (b) 1980–1995. Dark line indicates SOI and light line indicates lower tropospheric temperature. Periods of volcanic activity are indicated. It has been well known for many years that ENSO is associated with significant variability in global temperatures on short timescales of several years. However, this relationship cannot explain temperature trends on decadal and longer time scales. McLean et al 2009 grossly overstates the influence of ENSO, primarily by filtering out any long-term trends.

## AT: Ozone Hole

### Ozone hole stable – no decline this century

Yang et al 2006 – Professor at Georgia Institute of Technology [Eun-Su, 3/22/06, Journal of Geophysical Research, “Attribution of recovery in lower-stratospheric ozone,” with experts from Jet Propulsion Laboratory/California Institute of Technology, Hampton University, NASA/Langley Research Center, Global Monitoring Division at NOAA Earth System Research Laboratory, University of Alabama at Huntsville, DS]

Multiple satellite and ground-based observations provide consistent evidence that the thickness of Earth’s protective ozone layer has stopped declining since 1997, close to the time of peak stratospheric halogen loading. Regression analyses with Effective Equivalent Stratospheric Chlorine (EESC) in conjunction with further analyses using more sophisticated photochemical model calculations constrained by satellite data demonstrate that the cessation of ozone depletion between 18 and 25 km altitude is consistent with a leveling off of stratospheric abundances of chlorine and bromine, due to the Montreal Protocol and its amendments. However, ozone increases in the lowest part of the stratosphere, from the tropopause to 18 km, account for about half of the improvement in total column ozone during the past 9 years at Northern Hemisphere midlatitudes. The increase in ozone for altitudes below 18 km is most likely driven by changes in transport, rather than driven by declining chlorine and bromine. Even with this evidence that the Montreal Protocol and its amendments are having the desired, positive effect on ozone above 18 km, total column ozone is recovering faster than expected because of the apparent transport driven changes at lower altitudes. Accurate prediction of future levels of stratospheric ozone will require comprehensive understanding of the factors that drive temporal changes at various altitudes and partitioning of the recent transport-driven increases between natural variability and changes in atmospheric structure perhaps related to anthropogenic climate change.

## AT: Volcanoes

### Volcanoes are comparatively irrelevant – humans emit a hundred times more

Gerlach, ’10 – emeritus geologist at the USGS, Cascades Volcano Observatory [Terry, 6/30/2010, Earth Magazine, “Voices: Volcanic versus anthropogenic carbon dioxide: The missing science,” http://www.earthmagazine.org/earth/article/371-7da-7-1e, DS]

“Volcanoes add far more carbon dioxide to the oceans and atmosphere than humans.” So says geologist Ian Plimer of the University of Adelaide in his 2009 best seller “Heaven and Earth: Global Warming — the Missing Science.” With this assertion, Plimer brings volcanic carbon dioxide degassing front and center in the climate change debate, reviving and reinforcing this wildly mistaken notion. USGS Although discussions of volcanic carbon dioxide emissions make up less than 5 percent of “Heaven and Earth’s” text, the alleged predominance of volcanic over human carbon dioxide emissions is one of its most publicized takeaway messages. And one that will reverberate in the media and blogosphere — no matter how vociferously professionals who investigate volcanic carbon dioxide emissions bristle and huff about how appallingly at odds Plimer’s claim is with our research findings. The treatment of volcanic versus anthropogenic carbon dioxide emissions in this book illustrates one of the pathways by which myths, misrepresentations and spurious information get injected into the climate change debate. Like several climate skeptic publications, blogs and websites, “Heaven and Earth” does not provide the published estimates of the present-day global carbon dioxide emission rate from volcanoes. These estimates are, ironically, “the missing science” of a book professing to rectify supposed excesses of missing science — a book that appears impressively authoritative by citing a mountain of scientific literature. Several studies containing these estimates are among its 2,311 citations, but the estimates themselves are never divulged. Moreover, the book and other purveyors of this myth never explain, nor cite sources that explain, how it is known that volcanoes wholly outdo humans in adding carbon dioxide to the oceans and atmosphere. Published estimates based on research findings of the past 30 years for present-day global emission rates of carbon dioxide from subaerial and submarine volcanoes range from about 150 million to 270 million metric tons of carbon dioxide per year, with an average of about 200 million metric tons, These global volcanic estimates are utterly dwarfed by carbon dioxide emissions from fossil fuel burning, cement production, gas flaring and land use changes; these emissions accounted for some 36,300 million metric tons of carbon dioxide in 2008, according to an international study published in the December 2009 issue of Nature Geoscience. Even if you take the highest estimate of volcanic carbon dioxide emissions, at 270 million metric tons per year, human-emitted carbon dioxide levels are more than 130 times higher than volcanic emissions. Occasionally, scaled-down versions of the myth surface — for example, “Volcanoes produce more carbon dioxide than the world’s cars and industries combined.” The truth is that data from the Carbon Dioxide Information and Analysis Center of Oak Ridge National Laboratory and the International Energy Agency indicate that light-duty vehicles (cars, pickup trucks, SUVs, vans, wagons) contribute about 3,040 million metric tons of carbon dioxide per year, and industry adds another 6,100 million metric tons of carbon dioxide. The combined output is about 35 times greater than estimates of global volcanic carbon dioxide output. Another version of the myth is the all-powerful but poorly understood volcanic source. For example, “Heaven and Earth” describes submarine volcanoes as “poorly understood because of the lack of continuous observation and measurement,” yet “carbon dioxide from tens of thousands of submarine hot springs associated with these submarine basalt volcanoes quietly dissolves in the cold high-pressure deep ocean water.” Then, this statement: “One hot spring can release far more carbon dioxide than a 1,000-megawatt coal-fired power station yet they are neither seen nor measured.” If this is neither seen nor measured, then how does Plimer know how much carbon dioxide a hot spring emits? No supporting evidence or references are offered. In fact, there are measurements on the carbon dioxide flux of mid-ocean ridge hydrothermal fluids, but they do not support the power station comparison. According to the Environmental Protection Agency, the average carbon dioxide emission rate from coal-fired power generation in the United States is 1.02 metric tons per megawatt-hour. So, 1.02 metric tons of carbon dioxide per megawatt-hour, times 1,000 megawatts, times 24 hours per day, times 365 days per year, equals 8,935,200 metric tons of carbon dioxide per year. Thus, one of these submarine hot springs allegedly generates “far more” than 9 million metric tons of carbon dioxide per year — or far more than three times the annual baseline output of Kilauea Volcano in Hawaii! Just 12 of these hot springs would exceed carbon dioxide emission rate estimates for the entire 65,000-kilometer-long mid-ocean ridge system. To scale up volcanic carbon dioxide output to the current anthropogenic level would require adding thousands of volcanoes to the 50 to 60 normally active volcanoes of the subaerial landscape and more than a hundred additional mid-ocean ridge systems to the seafloor. Global volcanic carbon dioxide emission estimates contain uncertainties and are variable, but there is virtually no doubt that volcanism adds far less carbon dioxide to the oceans and atmosphere than humans.

## AT: CO2 from Oceans

### Carbon dioxide’s from fossil fuels – oxygen decrease and ocean pH prove

Mackie, ’10 – New Zealand chemical oceanographer [Doug, 6/26/10, Skeptical Science, “CO2 is coming from the ocean,” http://www.skepticalscience.com/co2-coming-from-ocean.htm, DS]

We can be confident the extra CO2 in the atmosphere has come from the oxidation of fossil fuels and not from outgassing from the ocean or from soil/land sources by using two key observations. 1. Oxygen decrease Atmospheric oxygen is going down by the same amount as atmospheric CO2 is going up. Oxygen is so abundant at about 21% (209,500 ppm) that we are in no danger of running out; the change in oxygen simply shows that whatever the source of CO2 in the atmosphere, the carbon part of it has come from the oxidation of reduced carbon compounds and the oxygen has come from oxygen gas in the atmosphere. That is, the extra CO2 was not released in the form of CO2 from an unknown source but instead some reduced carbon compound was burnt in the atmosphere to produce CO2. See: AR3WG1 Section 3.5.1, especially Figure 3.4. 2. Known fossil fuel CO2 emissions Most obviously, any alternative explanation for the source of the CO2 in the atmosphere has to also come up with where the 30 billion tonnes of CO2 known to be released by fossil fuel burning each year goes. Atmospheric CO2 is currently increasing at about 2 ppmv per year (or 16 billion tonnes). That is, only around half of the CO2 we release remains in the atmosphere. The pH decrease in the oceans corresponds to most of the “missing” CO2, so we can also be confident that land use changes etc are not a major source/sink. Caveat: Land use and biomass changes certainly soak up a lot of CO2, some it simply regrowth of forests etc, but the point is that the increasing CO2 in the atmosphere clearly demonstrates that they do not soak up enough.

## \*\*\*Warming Indicators\*\*

## AT: Balloons/Satellites

### Balloons wrong – old equipment destroyed data

Than, ‘5 – freelance science writer [Ker, 8/11/2005, LiveScience (accessed through MSNBC), “Key claim against global warming evaporates,” http://www.msnbc.msn.com/id/8917093/ns/technology\_and\_science-science/t/key-claim-against-global-warming-evaporates/, DS]

For years, skeptics of global warming have used satellite and weather balloon data to argue that climate models were wrong and that global warming isn't really happening. Now, according to three new studies published in the journal Science, it turns out those conclusions based on satellite and weather balloon data were based on faulty analyses. The atmosphere is indeed warming, not cooling as the data previously showed. While surface thermometers have clearly shown that the Earth's surface is warming, satellite and weather balloon data have actually suggested the opposite, that the atmosphere was cooling. Scientists were left with two choices: either the atmosphere wasn't warming up, or something was wrong with the data. "But most people had to conclude, based on the fact that there were both satellite and balloon observations, that it really wasn't warming up," said Steven Sherwood, a geologists at Yale University and lead author of one of the studies. Oops! Sherwood examined weather balloons known as radiosondes, which are capable of making direct measurements of atmospheric temperatures. For the past 40 years, radiosonde temperature data have been collected from around the world twice each day, once during the day and once at night. But while nighttime radiosonde measurements were consistent with climate models and theories showing a general warming trend, daytime measurements actually showed the atmosphere to be cooling since the 1970's. Sherwood explains these discrepancies by pointing out that the older radiosonde instruments used in the 1970's were not as well shielded from sunlight as more recent models. What this means as that older radiosondes showed warmer temperature readings during the day because they were warmed by sunlight. "It's like being outside on a hot day—it feels hotter when you are standing in the direct sun than when you are standing in the shade," Sherwood said. Nowadays, radiosondes are better insulated against the effects of sunlight, but if analyzed together with the old data—which showed temperatures that were actually warmer than they really were—the overall effect looked like the troposphere was cooling. The discrepancy between surface and atmospheric measurements has been used by for years by skeptics who dispute claims of global warming. "Now we're learning that the disconnect is more apparent than real," said Ben Santer, an atmospheric scientists at the Lawrence Livermore National Laboratory in California and a lead author of another of the studies. Argument evaporates According to Santer, the only group to previously analyze satellite data on the troposphere -- the lowest layer in Earth's atmosphere -- was a research team headed by Roy Spencer from University of Alabama in 1992. "This was used by some critics to say 'We don't believe in climate models, they're wrong,'" Santer told LiveScience. "Other people used the disconnect between what the satellites told and what surface thermometers told us to argue that the surface data were wrong and that earth wasn't really warming because satellites were much more accurate." The Alabama researchers introduced a correction factor to account for drifting in the satellites used to sample Earth's daily temperature cycles. But in another Science paper published today, Carl Mears and Rank Wentz, scientists at the California-based Remote Sensing Systems, examined the same data and identified an error in Spencer's analysis technique. After correcting for the mistake, the researchers obtained fundamentally different results: whereas Spencer's analysis showed a cooling of the Earth's troposphere, the new analysis revealed a warming. Using the analysis from Mears and Wentz, Santer showed that the new data was consistent with climate models and theories. "When people come up with extraordinary claims -- like the troposphere is cooling -- then you demand extraordinary proof," Santer said. "What's happening now is that people around the world are subjecting these data sets to the scrutiny they need."

## AT: Satellites

### Satellites prove warming – new studies conclude

Than, ‘5 – freelance science writer [Ker, 8/11/2005, LiveScience (accessed through MSNBC), “Key claim against global warming evaporates,” http://www.msnbc.msn.com/id/8917093/ns/technology\_and\_science-science/t/key-claim-against-global-warming-evaporates/, DS]

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## AT: Balloons/Satellites

### Balloons and satellites are wrong – old equipment and flawed analysis prove

Than, ‘5 – freelance science writer [Ker, 8/11/2005, LiveScience (accessed through MSNBC), “Key claim against global warming evaporates,” http://www.msnbc.msn.com/id/8917093/ns/technology\_and\_science-science/t/key-claim-against-global-warming-evaporates/, DS]

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## AT: Iris Hypothesis

### The Iris Hypothesis is wrong – flawed model and small sample size prove

Herring, ‘2 - climate scientist at NASA [David, “Does the Earth Have an Iris Analog?” NASA Earth Observatory, http://earthobservatory.nasa.gov/Study/Iris/printall.php]

“The Iris Hypothesis is very exciting,” states Bing Lin, an atmospheric research scientist at NASA LaRC. “Everybody would like to see tropical clouds changing in response to surface warming and acting to stabilize the climate system. The problem is when we used measurements from the Clouds and the Earth’s Radiant Energy System (CERES) sensor, we got significantly different results (from Lindzen).” Copies of the CERES sensor fly aboard both the NASA/NASDA Tropical Rainfall Measuring Mission (TRMM), launched in November 1997, and NASA’s Terra satellite, launched in December 1999. Additional CERES sensors will be launched aboard Terra’s sister ship, Aqua, in the spring of 2002. CERES is the most advanced space-based sensor ever launched for measuring Earth’s radiant energy fluxes on a global scale. Lin’s team took the measurements made every day by CERES over the tropical oceans and plugged them into the same model that Lindzen used. Instead of the strong negative feedback that Lindzen’s team found, Lin’s team found a weak positive feedback (Lin et al. 2001). That is, Lin found that clouds in the tropics do change in response to warmer sea surface temperatures, but that the cloud changes serve to slightly enhance warming at the surface. Specifically, whereas Lindzen’s experiment predicts that cirrus clouds change in extent to reduce warming at the surface by anywhere from 0.45 to 1.1 degrees, Lin’s experiment predicts that changes in the tropical clouds will help warm the surface by anywhere from 0.05 to 0.1 degree (Lin et al. 2001). The difference between the two experiments can be summed up as follows. According to the Iris Hypothesis, for each square meter of tropical cloudy, moist area that disappears with increasing surface temperature, 70 watts of heat is lost from the planet—like turning off a 70 watt light bulb for every square meter of area. But CERES’ measurements of cloud properties tell a very different story—clouds are much more reflective (51 percent instead of 35 percent) and somewhat weaker in their greenhouse effect than Lindzen’s model predicts. So instead of turning off a 70-watt bulb for each square meter affected, it is as if a small 2-watt night-light bulb was turned on in every square meter. Hence, the slight warming found by Lin’s team instead of the very large cooling found by Lindzen’s team. Lin says the reason his team’s findings differ so dramatically is because some of the initial assumptions made in Lindzen’s model are incorrect. He says that while he has many minor differences of opinion with Lindzen on this subject, he has three major disagreements. For starters, he says, the Indo-Pacific warm pool region does not serve as a model for the tropics all around the world. The waters there are, on average, much warmer than the rest of the tropics and so convection (warm, upward-moving air) is much stronger. Therefore, the area covered by deep convective cumulus clouds (thunderheads, basically) and cirrus clouds is not the same throughout the tropics. In the Indo-Pacific warm pool, these two cloud types cover about 13 percent of the region, whereas they only cover about 10 percent of the world’s tropics on a global scale (Lin et al. 2001). Lin’s team found that while tropical cloudiness does change as sea surface temperature changes, there is a large reduction in total cloud amount—roughly 10 percent cloud cover as compared to the 22 percent proposed by Lindzen’s team. Secondly, Lin disagrees with Lindzen’s proposed physical model of the clouds themselves. “Deep convective clouds very strongly reflect sunlight back to space,” he states, “but their relative area of coverage is small.” Cirrus clouds, on the other hand, are very extensive and cover large areas. They can be thin enough to allow sunlight to pass through, or they can also have a high reflectivity. Cirrus provides a much larger “canopy” over the tropics so, from a radiative perspective, those clouds are actually more important than deep cumulus clouds. The third major disagreement between Lin’s and Lindzen’s experiments pertains to the amount of heat escaping from cloudy regions. CERES measurements reveal that 155 Watts per square meter escaped the atmosphere over cloudy, moist regions, which is significantly more than the 138 Watts per square meter that Lindzen’s team assumed (Lin et al. 2001). In summary, Lindzen’s team suggests that higher sea surface temperatures lead to less cloudy, moist skies and a corresponding increase in clear, dry skies. Lin disagrees with Lindzen’s interpretation of the cloud physics. In their paper, Lin’s team wrote that the much smaller albedo and lower outgoing heat flux assumed by Lindzen exaggerated the cooling effects of the outgoing radiation over cloudy, moist regions while minimizing the warming effects of incoming sunlight through regions covered by cirrus (Lin et al. 2001). Based upon CERES data, Lin’s team concluded that the reduction in cloudy, moist skies allows extra sunlight to warm the surface by up to 1.8 Watts per square meter—a small but positive net energy flux (Lin et al. 2001). “Our results are based upon actual observations that are used to drive global climate models,” Lin concludes. “And when we use actual observations from CERES we find that the Iris Hypothesis won’t work.”

## AT: Stopped in 1998

### Warming didn’t stop in 1998 – ocean models prove

LePage, ‘8 - Director, Rowan Williams Davies & Irwin Inc., [Michael, “Special Report Climate Change: Climate myths: Global warming stopped in 1998,” http://environment.newscientist.com/channel/earth/climate-change/dn14527-climate-myths-global-warming-stopped-in-1998.html, DS]

In fact, the planet as a whole has warmed since 1998, sometimes even in the years when surface temperatures have fallen Imagine two people standing at the South Pole, one dressed in full Antarctic gear and the other wearing not much at all. Now imagine that you're looking through one of those infrared thermal imagers that show how hot things are. Which person will look warmest - and which will be frozen solid after a few hours? The answer, of course, is that the near-naked person will appear hotter: but because they are losing heat fast, they will freeze long before the person dressed more appropriately for the weather. The point is that you have to look beyond the surface to understand how a body's temperature will change over time - and that's as true of planets as it is of warm-blooded bipeds. Now take a look at the two main compilations (see figures, right) of global surface temperatures, based on monthly records from weather stations around the world. According to the dataset of the UK Met Office Hadley Centre (see figure), 1998 was the warmest year by far since records began, but since 2003 there has been slight cooling. But according to the dataset of NASA's Goddard Institute for Space Studies (see figure), 2005 was the warmest since records began, with 1998 and 2007 tied in second place. Tracking the heat Why the difference? The main reason is that there are no permanent weather stations in the Arctic Ocean, the place on Earth that has been warming fastest. The Hadley record simply excludes this area, whereas the NASA version assumes its surface temperature is the same as that of the nearest land-based stations. It is possible that the NASA approach underestimates the rate of warming in the Arctic Ocean, but for the sake of argument let's assume that the Hadley record is the most accurate reflection of changes in global surface temperatures. Doesn't it show that the world has cooled since the record warmth of 1998, as many claim? Not necessarily. The Hadley record is based only on surface temperatures, so it reflects only what's happening to the very thin layer where air meets the land and sea. In the long term, what matters is how much heat is gained or lost by the entire planet - what climate scientists call the "top of the atmosphere" radiation budget - and falling surface temperatures do not prove that the entire planet is losing heat. Swaddling gases Think again about that scantily clad person at the South Pole. If they put on some clothing, they'll appear cooler to a thermal imager, but what's really happening is that they are losing less heat. Similarly, if you could look at Earth through a thermal imager, it would appear slightly cooler than it did a few decades ago. The reason is that the outer atmosphere, the stratosphere, is cooler because we've added more "clothing" to the lower atmosphere in the form of greenhouse gases like carbon dioxide. As a result, the planet is gaining as much heat from the sun as usual but losing less heat every year as greenhouse gas levels rise (apart from the exceptional periods after major volcanic eruptions, such as El Chichon in 1982 and Pinatubo in 1991). How do we know? Because the oceans are getting warmer. Tricky oceans Water stores an immense amount of heat compared with air. It takes more than 1000 times as much energy to heat a cubic metre of water by 1 degree Celsius as it does the same volume of air. Since the 1960s, over 90% of the excess heat due to higher greenhouse gas levels has gone into the oceans, and just 3% into warming the atmosphere (see figure 5.4 in the IPCC report (PDF)). Globally, this means that if the oceans soak up a bit more heat energy than normal, surface air temperatures can fall even though the total heat content of the planet is rising. Conversely, if the oceans soak up less heat than usual, surface temperatures will rise rapidly. In fact, most of the year-to-year variability in surface temperatures is due to heat sloshing back and forth between the oceans and atmosphere, rather than to the planet as a whole gaining or losing heat. The record warmth of 1998 was not due to a sudden spurt in global warming but to a very strong El Niño (see figure, right). In normal years, trade winds keep hot water piled up on the western side of the tropical Pacific. During an El Niño, the winds weaken and the hot water spreads out across the Pacific in a shallow layer, which increases heat transfer to the atmosphere. (During a La Niña, by contrast, as occurred during the early part of 2008, the process is reversed and upwelling cold water in the eastern Pacific soaks up heat from the atmosphere.) A temporary fall in the heat content of the oceans at this time may have been due to the extra strong El Niño. What next? Since 1999, however, the heat content of the oceans has increased (despite claims to the contrary). Global warming has certainly not stopped, even if average surface temperatures really have fallen slightly as the Hadley figures suggest. In the long term, some of the heat being soaked up by the oceans will inevitably spill back into the atmosphere, raising surface temperatures. Warmer oceans also mean rising sea levels, due to both thermal expansion and the melting of the floating ice shelves that slow down glaciers sliding off land into the sea. The West Antarctic Ice Sheet, which rests on the seabed rather than on land, is also highly vulnerable to rising sea temperatures. Some climate scientists are predicting that surface temperatures will remain static or even fall slightly over the next few years, before warming resumes. Their predictions are based largely on the idea that changes in long-term fluctuation in ocean surface temperatures known as the Atlantic Multidecadal Oscillation and the Pacific Decadal Oscillation will bring cooler sea surface temperatures. If these predictions are right - and not all climate scientists think they are - you can expect to hear more claims from climate-change deniers about how global warming has stopped. But unless we see a simultaneous fall in both surface temperatures and ocean-heat content, claims that the "entire planet" is cooling are nonsense. And while some events such as a big volcanic eruption could indeed trigger genuine cooling for a few years, global warming will resume again once the dust has settled.

## AT: Antarctic Cooling

### Antarctica’s warming – you ignore the western half

Carrington, ‘9 - Head environmental reporter, Guardian [Damian, 1/23/2009, The Guardian, “Scientists solve enigma of Antarctic ‘cooling’,” http://www.guardian.co.uk/environment/2009/jan/21/global-warming-antarctica, DS]

Scientists have solved the enigma of the Antarctic apparently getting cooler, while the rest of the world heats up. New research shows that while some parts of the frozen continent have been getting slightly colder over the last few decades, the average temperature across the continent has been rising for at least the last 50 years. In the remote and inaccessible West Antarctic region the new research, based on ground measurements and satellite data, show that the region has warmed rapidly, by 0.17C each decade since 1957. "We had no idea what was happening there," said Professor Eric Steig, at the University of Washington, Seattle, and who led the research published in Nature. This outweighs the cooling seen in East Antarctica, so that, overall, the continent has warmed by 0.12C each decade over the same period. This matches the warming of the southern hemisphere as a whole and removes the apparent contradiction. The issue, which had been highlighted by global warming sceptics, was an annoyance, said Steig, despite the science having been reasonably well understood. "But it has now been killed off," he said. Gareth Marshall, climatologist at British Antarctic Survey, commented: "This work allows us to look at the continent as a whole, which we have not been able to do before with confidence. It fills a big hole in the data in West Antarctica – it is the final piece in the jigsaw." The rapid warming now revealed in the west concerns some scientists. The new analysis suggests the West Antarctic ice sheet, like that in Greenland, is precariously balanced, said Professor Barry Brook at the University of Adelaide. "Even losing a fraction of both would cause a few metres of sea level rise this century, with disastrous consequences," he said. It was well known that a small part of Antarctic was warming – the peninsula that protrudes northwards towards South America and is the site of many research stations. But researchers knew that East Antarctica had cooled a little in recent decades and thought that might be the case across the continent's great mountain range in West Antarctica. Temperature records have been taken on the ground since the first weather stations were built in 1957. But all but two of the 42 are very close to the coast and therefore give no information on the vast interior of the continent. Satellite data, in contrast, can take the temperature of the entire region by measuring the intensity of the infrared radiation reflected from the snow pack and has been available since 1980. Steig's team found the mathematical relationships between the weather station data and satellite data, tested them, and then used them to go back in time to estimate temperatures across the continent back to 1957. Their statistical model has now been validated by an ice core drilled into the Rutford ice stream in West Antarctica by the British Antarctic Survey, from which temperature records can be measured. That independent work also came up with a warming of 0.17C a decade for the region, and stretched the trend back to at least 1930. The cooling seen in East Antarctica is caused in part by the ozone hole that opens each year in the atmosphere. The ozone hole causes an increase in westerly winds which, by a complex interaction of wind, sea and ice, results in lower temperatures in the east. Emissions of ozone-destroying gases have now almost been eliminated and the hole is expected to recover by mid-century. When that happens, there will be a rapid catch up of temperatures, says Marshall. The 2007 report from the UN's Intergovernmental Panel on Climate Change said that the impact of greenhouse gas emissions could be seen on every continent bar Antarctica. The new work, along with another recent study, now clearly shows that the rising temperature of the continent cannot be explained by natural climate variation alone.

## AT: Sunspot Hibernation

### Sunspot hibernation’s irrelevant – global temperatures vastly outweigh

Biello 6/19 - Associate Editor at Scientific American [David, 6/19/2011, Scientific American (podcast), “Sunspot-Related Cooling Can't Offset Greenhouse Warming,” http://www.scientificamerican.com/podcast/episode.cfm?id=sunspot-related-cooling-cant-offset-11-06-19, DS]

How much light the sun emits affects the Earth's weather and climate. And sunspots—dark dots on the face of the great fusion reactor in the sky—do alter the orb's output. So when solar scientists said last week that sunspot cycles might be going into hibernation, the impact on our planet's climate became a hot topic. Previous prolonged weakenings in the solar cycle may have launched mini-Ice Ages. An example is the so-called Maunder Minimum in the 1600s and 1700s when the Thames River routinely froze, something that never happens today. So if we're to face a temporarily cooler sun, maybe all those greenhouse gases we've been putting into the atmosphere will keep us toasty? A cooler sun might mean a drop in global average temperatures of at most 0.3 degree Celsius. But the carbon dioxide already in the atmosphere today will add 0.6 degree Celsius to global average temperatures by the end of the century. And more, since greenhouse gas emissions show no signs of diminishing. So the slightly cooler sun won't counteract a much hotter Earth.

## AT: 1934

### **1934 was cold worldwide – doesn’t disprove global warming**

Meador, ’10 - Molecular biologist [Jim, 12/8/2010, *Skeptical Science*, “1934 is the hottest year on record,” http://www.skepticalscience.com/1934-hottest-year-on-record.htm, DS]

The year 1934 was a very hot year in the United States, ranking third behind 2006 and 1998. However, global warming takes into account temperatures over the entire planet. The U.S.'s land area accounts for only 2% of the earth's total surface area. Despite the U.S. heat in 1934, the year was not so hot over the rest of the planet, and is barely holding onto a place in the hottest 50 years in the global rankings (today it ranks 47th). Climate change skeptics like to point to 1934 in the U.S. as proof that recent hot years are not unusual. However, this is another example of "cherry-picking" a single fact that supports a claim, while ignoring the rest of the data. Globally, the ten hottest years on record have all occurred since 1998, with 2005 as the hottest. Right now 2010 is on track to join the top ten, which will knock 2004 off of the list. The fact that there were hot years in some parts of the world in the past is a weak argument against climate change. There will always be regional temperature variations as well as variations from year to year. These happened in the past, and they will continue. The problem with climate change is that on average, when looking at the entire world, the long term trend shows an unmistakable increase in global surface temperatures, in a way that is likely to dramatically alter the planet.

## AT: Oceans

### Oceans prove warming – temperature drives sea levels

Schmid, 6/20 – AP Science Writer [Randolph E., 6/20/2011, Huffington Post, “Sea Levels Rising At Fastest Rate in 2,100 Years: Study,” http://www.huffingtonpost.com/2011/06/22/sea-levels-rising-at-fast\_n\_882654.html, DS]

WASHINGTON -- Sea level has been rising significantly over the past century of global warming, according to a study that offers the most detailed look yet at the changes in ocean levels during the last 2,100 years. The researchers found that since the late 19th century – as the world became industrialized – sea level has risen more than 2 millimeters per year, on average. That's a bit less than one-tenth of an inch, but it adds up over time. It will lead to land loss, more flooding and saltwater invading bodies of fresh water, said lead researcher Benjamin Horton whose team examined sediment from North Carolina's Outer Banks. He directs the Sea Level Research Laboratory at the University of Pennsylvania. The predicted effects he cites aren't new and are predicted by many climate scientists. But outside experts say the research verifies increasing sea level rise compared to previous centuries. Kenneth Miller, chairman of the Department of Earth and Planetary Sciences at Rutgers University, called the new report significant. "This is a very important contribution because it firmly establishes that the rise in sea level in the 20th century is unprecedented for the recent geologic past," said Miller, who was not part of the research team. Miller said he recently advised New Jersey Gov. Chris Christie that the state needs to plan for a sea level rise of about 3 feet by the end of the century. Horton said rising temperatures are the reason behind the higher sea level. Looking back in history, the researchers found that sea level was relatively stable from 100 B.C. to A.D. 950. Then, during a warm climate period beginning in the 11th century, sea level rose by about half a millimeter per year for 400 years. That was followed by a second period of stable sea level associated with a cooler period, known as the Little Ice Age, which persisted until the late 19th century. Rising sea levels are among the hazards that concern environmentalists and governments with increasing global temperatures caused by "greenhouse" gases like carbon dioxide from burning fossil fuels like coal and oil over the last century or so. Although melting icebergs floating on the sea won't change sea level, there are millions of tons of ice piled up on land in Greenland, Antarctica and elsewhere. Melting that ice would have a major impact by raising ocean levels. The result could include flooding in highly populated coastal cities and greater storm damage in oceanfront communities. While the new study does not predict the future, Horton pointed out that it does show "there is a very close link between sea level and temperature. So for the 21st century when temperatures will rise, so will sea level." Two of his co-authors calculated in an earlier paper that sea level could rise by between 30 and 75 inches by the end of this century. And it might even rise faster than that, Martin Vermeer of Aalto University in Finland and Stefan Rahmstorf of Germany's Potsdam Institute for Climate Impact reported in 2009. "Accurate estimates of past sea-level variability provide a context for such projections," co-author Andrew Kemp of Yale University's Climate and Energy Institute said in a statement. Horton's team studied sediment cores from salt marshes at Sand Point and Tump Point on the North Carolina coast to develop their calculations of sea-level change over the two millennia. They analyzed microfossils in the cores and the age of the cores was estimated using radiocarbon dating and other methods. For the years since tide gauges have been installed, those findings closely track the results from the study, the researchers noted. The study is being published in this week's edition of the Proceedings of the National Academy of Sciences. While Horton's report is the first to produce a continuous record of the past 2,000 years "other studies show similar changes, especially concerning the acceleration in sea level rise in the 20th century," Miller said.

## AT: Ocean Sinks

### Ocean sinks fail – rising temperatures mean no absorption

Knight 7/11 – CNN World reporter [Matthew, 7/11/2011, CNN World, “Ocean carbon sinks feeling the heat,” http://articles.cnn.com/2011-07-11/world/atlantic.ocean.carbon.warming\_1\_carbon-emissions-ocean-carbon-co2?\_s=PM:WORLD, DS]

The ability of oceans to soak up atmospheric carbon dioxide is being hampered by climate change, according to a new scientific study. A fresh analysis of existing observational data taken from locations across the North Atlantic Ocean recorded over a period of almost three decades (1981-2009) has revealed that global warming is having a negative impact on one of nature's most important carbon sinks. "Warming in the past four to five years has started to reduce the amount of carbon that large areas of the (North Atlantic) Ocean is picking up," said Galen McKinley, lead author and assistant professor of atmospheric and oceanic sciences at the University of Wisconsin-Madison. According to the National Oceanic and Atmospheric Administration global ocean temperatures have risen by 0.74 degrees Celsius since the late 19th century. The new study identified underlying trends in surface CO2 by examining data across three distinct biogeographic regions ("biomes") ranging from the subpolar gyre (circular ocean currents) in the north to two subtropical gyres further south. Combined, these regions make up 87% of the total area of the North Atlantic Ocean, according to the paper published in the journal Nature Geoscience. Data was collected from hundreds of scientific ships and container vessels equipped with special instrumentation. Increases in atmospheric carbon dioxide have largely been matched by corresponding increases in dissolved CO2 in the seawater in the past three decades, according to the study. But there are also huge expanses of ocean where rising temperatures are slowing carbon absorption -- warmer water cannot hold as much CO2, say scientists. "We are already seeing this in the North Atlantic subtropical gyre, and this is some of the first evidence for climate damping the ocean's ability to take up carbon from the atmosphere," McKinley said. Previous scientific studies in this area have produced conflicting results caused by uncertainty over natural variability -- like North Atlantic oscillation and El Nino -- and its affects on CO2 absorption. But McKinley says the breadth of this latest study cuts through this variability -- which often masks longer-term patterns of change -- enabling clearer identification of underlying trends in surface CO2 throughout the North Atlantic. Climate warming would be a lot faster if not for these sinks, she says. Oceans worldwide currently soak up around a quarter of atmospheric carbon, while land-based sinks account for a similar percentage. But manmade emissions continue to rise reaching record levels in 2010, according to the International Energy Agency. Any changes in the efficiency of ocean sinks will have important implications for the planet and for policy-makers trying to tackle carbon emissions effectively, McKinley says. "We need to continue to monitor this and see how things proceed because if humans are going to achieve some sort of stabilization of carbon in the atmosphere we really need to quantify what those sinks are going to be and how they are going to change with time," she said.

## AT: Biomass

### **Biomass feedbacks minimal – other microbes outweigh CO2**

Zeller, 7/13 – environment reporter, New York Times [Tom Jr., 7/13/2011, Huffington Post, “Global Warming: Nature Can’t Save Us From Ourselves,” http://www.huffingtonpost.com/2011/07/13/global-warming-effects\_n\_897135.html, DS]

The notion that nature itself will act as a check on the atmospheric excesses of humanity has long held a fair amount of appeal, not least because it draws on a nugget of high-school science that most people can quickly comprehend. Plants inhale carbon dioxide, after all -- they need it to grow. Add more CO2 to the air, as human civilization has been doing in copious amounts since the dawn of the Industrial Revolution, and the result will surely be thicker, more expansive biomass. More trees, plants and crops, the thinking goes, means that more and more carbon dioxide will be naturally absorbed from the atmosphere, and ... voila! The climate problem is elegantly solved! It's a conviction readily embraced by climate skeptics, and one enthusiastically peddled in some scientific cul-de-sacs like the Center for the Study of Carbon Dioxide and Global Change, a pet project of Sherwood B. Idso, a former research physicist with the Department of Agriculture, and his two sons, Craig and Keith. From the center's Web site: For years environmentalists have warned us about how fragile earth's biosphere is; and in many cases dealing with specific species or ecosystems, they have been correct. In its totality, however, the biosphere is much more resilient than most people give it credit for being. As atmospheric CO2 -- the lifeblood of the planet -- has gradually risen over the course of the Industrial Revolution, for example, the biosphere has begun to reveal its true strength, with the plants of the planet growing ever more robustly and profusely, as they expand their ranges over the face of the earth and extract ever greater quantities of CO2 from the air and sequester its carbon in their tissues and the soil into which they sink their roots. Nothing inherently nonsensical here -- but the Idsos take it to the extreme, essentially arguing that the planet can't have too much of a good thing. "Science tells us that putting more CO2 in the air would actually be good for the planet," the Idsos assert. (The family's research center, which has received funding from ExxonMobil, also ranks #8 on Mother Jones magazine's "Dirty Dozen of Climate Change Denial," for whatever that's worth.) The fact is, most climate models do suggest that higher concentrations of carbon dioxide will spur increased plant growth, and that this will have some mitigating effect on what would otherwise be unchecked global warming. Just how significant this or myriad other planetary feedback effects might be in tweaking the Earth's thermostat over time is a matter of some speculation -- and the subject of fervent activity among designers of evermore accurate climate models. But scientists generally agree that the influence of increased biomass will be modest, essentially acting like a brake on a runaway freight train. It might be able to slow steadily rising temperatures, but it will hardly be enough to stop global warming in its tracks. What's more, most studies have ignored the influence of other potent global warming compounds like nitrous oxide and methane. Both are known to be released from soil in varying amounts, depending on the landscape, as atmospheric carbon dioxide increases. A new study from Northern Arizona University, published Wednesday in the journal Nature, throws N2O and methane into the mix, and the results suggest that nature's defenses against global warming are even less effective than previously thought. "This is one more reason why we should not expect nature to help clean up our climate change problem," said Bruce Hungate, a co-author of the study and a professor of biological sciences at Northern Arizona University. The study -- a meta-analysis of dozens of separate studies of soil emissions in variety of ecosystems, including forests, farmland, rice paddies, grasslands and wetlands in North America, Europe and Asia -- found that increased atmospheric carbon dioxide causes soil to release methane and nitrous oxide in amounts significant and sustained enough to reduce the overall cooling effect of increased biomass by nearly 20 percent. What's going on? Organisms in soil, it seems, thrive on both nitrate and carbon dioxide. These microbes also produce methane and nitrous oxide, which are, respectively, about 25 times and 300 times more effective at trapping heat than even CO2. As humans pump more carbon dioxide into the atmosphere, these organisms pump out more N2O and methane. The body of literature on this effect suggested that it varied in degree from one ecosystem to another. This variation made it difficult to determine whether, on the whole, its impact on the global climate was significant or merely a wash. Yet the new study provides a clear answer: the effect is significant. Hungate said he was surprised by the results, which he obtained no matter how he and his co-authors weighted the various studies. "We're not just looking at a statistical fluke," he said, adding that the reduction in cooling that the study ultimately attributed to soil emissions was probably an underestimate, given the lack of available data from tropical ecosystems, which have yet to be substantively studied in this regard. Still, the allure of the notion that nature will heal itself is a powerful one. A study from NASA in December, for example, was widely heralded as suggesting that global warming was no longer a worry. "A new NASA computer modeling effort," stated a press release issued at the time, "has found that additional growth of plants and trees in a world with doubled atmospheric carbon dioxide levels would create a new negative feedback - a cooling effect - in the Earth's climate system that could work to reduce future global warming." That the study clearly asserted that this cooling effect would be no real match for the overall trend of rising temperatures was missing from some reports of the news. "A group of top NASA boffins says that current climate models predicting global warming are far too gloomy," began an article at The Register, a British-based technology news site, "and have failed to properly account for an important cooling factor which will come into play as CO2 levels rise." The Guardian newspaper's Environment Blog offered a withering deconstruction of The Register's misinterpretation of the study, but the original nonsense enjoyed widespread distribution on the Web. Still, Ken Caldeira, a prominent climate scientist at the Carnegie Institution's department of global ecology, suggested in an email that the new research out of Northern Arizona University made the situation facing humanity quite plain. "To solve the carbon-climate problem, we need to transform our energy system into one that does not dump its waste into the sky," Caldeira said. "Land plants help. It looks like they won't help quite as much as we thought they would. Clearly, we can't expect nature to solve our problems for us." In other words, while the ability of the planet to heal itself is a factor, it's ultimately up to humans to sort out the climate mess. Nature won't save the day.

## \*\*\* Positive Feedbacks \*\*\*

## AT: Forests

### **Forest sinks are net positive – release comparatively worse microbes**

Lauder 7/14 [Simon, 7/14/2011, ABC News Australia, “Study casts doubt on forest carbon capture plans,” http://www.abc.net.au/news/2011-07-14/tree-planting-carbon-offset/2794426, DS]

US scientists have found that the more carbon dioxide goes into soil, the more the soil releases other, more potent, greenhouse gases. This means Australian companies planting trees to soak up CO2 in return for Carbon Credit Units under the carbon tax may not actually be counteracting their emissions. The study, published in the science journal Nature, found that plants taking up more carbon dioxide resulted in an accelerated production of nitrous oxide and methane. The study says the value of trees as carbon credits could be written down by a fifth. The value of the units is expected to be set in law if it is passed by the Senate next month. Forests and soil are often seen as carbon sink centres, with tree-planting the main method for offsetting carbon emissions. University of Florida researcher and co-author of the study Professor Craig Osenberg says Australia may need to rethink its emissions strategy. "Plants are taking up the carbon dioxide but in the process of that increased plant production and the carbon dioxide enrichment, the microbes are putting out nitrous oxide and methane," he said. But Professor Osenberg says the study still finds the method to be beneficial. Northern Arizona University and study co-author Professor Bruce Hungate says with all gases considered, planting trees is 20 per cent less effective than previously thought. "When you increase carbon dioxide in the atmosphere, you get a greater release of these potent greenhouse gases," he said. "One way to think about it is if carbon dioxide concentrations increase in the atmosphere we expect ecosystems to soak up more carbon. One of the things this effect does is it reduces the value of that increased carbon uptake, because by releasing these more potent greenhouse gases, you essentially get less of a cooling benefit of the ecosystem's natural response to rising carbon dioxide." Professor Hungate suggests Australia should go to the source of greenhouse emissions to reduce its carbon footprint. "The key thing is it's a lot more effective to reduce emissions by going to the source of increased greenhouse gases than it is to rely on natural systems to mop up on this for us," he said.

## AT: Water Vapor

### **Water vapor’s a positive feedback – global humidity measurements prove**

Dessler et al, ‘8 - Professors of Atmospheric Sciences at Texas A&M [A.E., Z. Zhang, P. Yang; Geophysical Research Letters, “Water-vapor climate feedback inferred from climate fluctuations, 2003-2008,” http://www.agu.org/pubs/crossref/2008/2008GL035333.shtml, DS]

Between 2003 and 2008, the global-average surface temperature of the Earth varied by 0.6°C. We analyze here the response of tropospheric water vapor to these variations. Height-resolved measurements of specific humidity (q) and relative humidity (RH) are obtained from NASA's satellite-borne Atmospheric Infrared Sounder (AIRS). Over most of the troposphere, q [specific humidity] increased with increasing global-average surface temperature, although some regions showed the opposite response. RH [relative humidity] increased in some regions and decreased in others, with the global average remaining nearly constant at most altitudes. The water-vapor feedback implied by these observations is strongly positive, with an average magnitude of λ q = 2.04 W/m2/K, similar to that simulated by climate models. The magnitude is similar to that obtained if the atmosphere maintained constant RH everywhere.

## AT: Clouds

### Clouds are a positive feedback – best models and observations prove

Clement et al, ‘9 – Atmospheric Professors at U of Miami and Oceanography Prof at UC San Diego [Amy C. Clement (Miami), Robert Burgman (Miami), Joel R. Norris (UCSD), 7/24/2009, “Observational and Model Evidence for Positive Low-Level Cloud Feedback,” Science, http://www.sciencemag.org/content/325/5939/460.abstract?sid=5faf6442-a22f-489b-95a6-c3b80628e4e1, DS]

Feedbacks involving low-level clouds remain a primary cause of uncertainty in global climate model projections. This issue was addressed by examining changes in low-level clouds over the Northeast Pacific in observations and climate models. Decadal fluctuations were identified in multiple, independent cloud data sets, and changes in cloud cover appeared to be linked to changes in both local temperature structure and large-scale circulation. This observational analysis further indicated that clouds act as a positive feedback in this region on decadal time scales. The observed relationships between cloud cover and regional meteorological conditions provide a more complete way of testing the realism of the cloud simulation in current-generation climate models. The only model that passed this test simulated a reduction in cloud cover over much of the Pacific when greenhouse gases were increased, providing modeling evidence for a positive low-level cloud feedback.

## AT: Carbon Sinks

### Carbon sinks can’t stop warming – they’re a positive feedback

McCarthy, ‘7 – Environment Editor at The Independent [Michael, 5/18/2007, The Independent, “Earth's natural defences against climate change 'beginning to fail',” http://www.independent.co.uk/environment/climate-change/earths-natural-defences-against-climate-change-beginning-to-fail-449340.html , DS]

The earth's ability to soak up the gases causing global warming is beginning to fail because of rising temperatures, in a long-feared sign of "positive feedback," new research reveals today. Climate change itself is weakening one of the principal "sinks" absorbing carbon dioxide - the Southern Ocean around Antarctica - a new study has found. As a result, atmospheric CO2 levels may rise faster and bring about rising temperatures more quickly than previously anticipated. Stabilising the CO2 level, which must be done to bring the warming under control, is likely to become much more difficult, even if the world community agrees to do it. The news may give added urgency to the meeting in three weeks' time between the G8 group of rich nations and the leading developing countries led by China, at Heiligendamm in Germany, when an attempt will be made to put together the framework of a new world climate treaty to succeed the current Kyoto protocol. "This is a timely warning in advance of Heiligendamm and the G8 that the climate clock is beginning to tick faster," said the leading environmentalist Tom Burke, visiting professor at Imperial College London. "The shift that has been detected in a four-year study by researchers from the University of East Anglia, the British Antarctic Survey and the Max-Planck Institute for Biogeochemistry, published in the journal Science, is one of the most ominous in the development of climate change. It implies a breach in the planet's own defences against global warming. Human society has hugely benefited from the earth's natural carbon absorption facility, which means oceans and forests take up roughly half of the CO2 pumped into the atmosphere, in the so-called carbon cycle. What is left in the atmosphere is known as the "airborne fraction". If sinks weakened, the airborne fraction would be likely to get bigger. Although supercomputer models of the climate have for some time predicted the weakening of the ocean and terrestrial sinks, no example of it happening has actually been detected - until now. Now the research team has found the vast Southern Ocean, which is the earth's biggest carbon sink, accounting for about 15 per cent of the total absorption potential, has become effectively CO2-saturated. The level of the gas it is absorbing has remained static since 1981 - but in that time the amount emitted has grown by 40 per cent, so it has stopped keeping pace and much more CO2 is left over to trap the sun's heat. The effect - revealed by scrutinising observations of atmospheric CO2 from 40 stations around the world, is thought to have been caused by an increase in ocean wind speeds. Stormier weather and stronger waves are churning up the sea and bringing natural CO2 stored there closer to the surface - which reduces the ability of the surface to absorb the gas from the air. The increased winds are believed to be caused by altered atmospheric temperature regimes produced by two separate processes - the depletion of the ozone layer over Antarctica by chlorofluorocarbon gases from aerosol spray cans (now phased out), and global warming. It is thus a positive feedback - an effect of climate change which itself makes climate change worse. Some researchers fear that feedbacks may make global warming happen much faster, and harder to control, than generally appreciated. The pessimism of scientists such as James Lovelock is largely based on the fact that most feedbacks in the earth's system are likely to work against us. "This is the first unequivocal detection of a carbon sink weakening because of recent climate change," said the lead author of the study, Corinne Le Quéré, of the University of East Anglia. "This is serious. Whenever the world has greatly warmed in the past, the weakening of CO2 sinks has contributed to it." Professor Chris Rapley, director of the British Antarctic Survey, said: "Since the beginning of the Industrial Revolution the world's oceans have absorbed about a quarter of the 500 gigatons [millions of tonnes] of carbon emitted by humans. The possibility that in a warmer world the Southern Ocean is weakening is a cause for concern." The Government's chief scientific adviser, Sir David King, said: "We have quite a large number of positive feedbacks to worry about, and this appears to be another one. But the seriousness of it would depend on if it was affecting the whole ocean, or merely the Southern Ocean." In recent years it has become clear that the rate at which CO2 was accumulating is itself increasing. The level currently stands at about 382 parts per million by volume (ppm), up from 315 ppm in 1958. In the past decade the rate has jumped from about 1.6ppm annually to well above 2ppm - a fact which, as The Independent reported in October 2004, may well signal that the earth's absorption ability is shrinking. Asked if this rate increase could now be linked to weakening sinks, Dr Le Quéré said: "I think we are just at the border of detecting that." She added: "All the carbon cycle experts have their eyes on it."

## AT: Plankton

### Warming kills plankton – makes them a positive feedback

Connor, ‘5 - Science Editor at The Independent [Steve, 1/19/2005, The Independent, “Warmer Seas Will Wipe Out Plankton,” http://www.rense.com/general69/warm.htm, DS]

The microscopic plants that underpin all life in the oceans are likely to be destroyed by global warming, a study has found. Scientists have discovered a way that the vital plankton of the oceans can be starved of nutrients as a result of the seas getting warmer. They believe the findings have catastrophic implications for the entire marine habitat, which ultimately relies on plankton at the base of the food chain. The study is also potentially devastating because it has thrown up a new "positive feedback" mechanism that could result in more carbon dioxide ending up in the atmosphere to cause a runaway greenhouse effect. Scientists led by Jef Huisman of the University of Amsterdam have calculated that global warming, which is causing the temperature of the sea surface to rise, will also interfere with the vital upward movement of nutrients from the deep sea. These nutrients, containing nitrogen, phosphorus and iron, are vital food for phytoplankton. If the supply is interrupted the plants die off, which prevents them from absorbing carbon dioxide from the atmosphere. "Global warming of the surface layers of the oceans reduces the upward transport of nutrients into the surface layers. This generates chaos among the plankton," the professor said. The sea is one of nature's "carbon sinks", which removes carbon dioxide from the atmosphere and deposits the carbon in a long-term store - dissolved in the ocean or deposited as organic waste on the seabed. The vast quantities of phytoplankton in the oceans absorb huge amounts of carbon dioxide. When the organisms die they fall to the seabed, carrying their store of carbon with them, where it stays for many thousands of years - thereby helping to counter global warming. "Plankton... forms the basis of the marine food web. Moreover, phytoplankton consumes the greenhouse gas carbon dioxide during photosynthesis," Professor Huisman said. "Uptake of carbon dioxide by phytoplankton across the vast expanses of the oceans reduces the rising carbon dioxide levels in the atmosphere." Warmer surface water caused by global warming causes greater temperature stratification, with warm surface layers sitting on deeper, colder layers, to prevent mixing of nutrients. Professor Huisman shows in a study published in Nature that warmer sea surfaces will deliver a potentially devastating blow to the supply of deep-sea nutrients for phytoplankton. His computer model of the impact was tested on real measurements made in the Pacific Ocean, where sea surface temperatures tend to be higher than in other parts of the world. He found that his computer predictions of how nutrient movement would be interrupted were accurate. "A larger temperature difference between two water layers implies less mixing of chemicals between these water layers," he said. "Global warming of the surface layers of the oceans, owing to climate change, strengthens the stratification and thereby reduces the upward mixing of nutrients." Scientists had believed phytoplankton, which survives best at depths of about 100 metres, is largely stable and immune from the impact of global warming. "This model prediction was rather unexpected," Professor Huisman said. "Reduced stability of the plankton, caused by global warming of the oceans, may result in a decline of oceanic production and reduced sequestration of the greenhouse gas carbon dioxide into the oceans." Vital link in the food chain Microscopic plankton comes in animal and plant forms. The plants are known as phytoplankton. They lie at the base of the marine food chain because they convert sunlight and carbon dioxide into organic carbon - food for everything else. Smaller animals such as shrimp-like krill feed on plankton and are themselves eaten by larger organisms, from small fish to the biggest whales. Without phytoplankton, the oceans would soon because marine deserts. Phytoplankton are also important because of the role they play in the carbon cycle, which determines how much carbon dioxide - the most important greenhouse gas - ends up in the atmosphere to cause global warming. Huge amounts of carbon dioxide from the atmosphere, which dissolves in the oceans, are absorbed by phytoplankton and converted to organic carbon. When the phytoplankton die, their shells and bodies sink to the seabed, carrying this carbon with them. Phytoplankton therefore acts as a carbon "sink" which takes carbon dioxide from the atmosphere and deposits the carbon in long-term stores that can remain undisturbed for thousands of years. If the growth of phytoplankton is interrupted by global warming, this ability to act as a buffer against global warming is also affected - leading to a much-feared positive feedback.

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### DOD fossil fuel dependence will inevitably constrain US hegemony- limits forward deployment and hamstrings the DOD budget.

Crowley et al 07 (Thomas, president- Peabody & Associates, Inc., an economic consulting firm that specializes in solving economic, transportation, marketing, and fuel supply problems, TRANSFORMING THE WAY DOD LOOKS AT ENERGY AN APPROACH TO ESTABLISHING AN ENERGY STRATEGY, April, http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA467003)

DISCONNECTS BETWEEN ENERGY POLICY AND STRATEGIC OBJECTIVES The demands placed on the armed forces have changed significantly since their current capabilities were designed and fielded and the plans and concepts for their employment were developed. The security challenges of the 21st century require a force structure that is more expeditionary, agile, and responsive. Such a force structure will consume increasing amounts of energy if current trends continue. Building this future force structure requires the application of resources, yet budgets will be increasingly constrained by operational energy demands. We call the misalignments between energy policies and strategic objectives “disconnects,” and they exist along three lines: strategic, operational, and fiscal. In recognition of the political factors associated with increasing energy consumption and some alternative energy solutions, we also identified a fourth disconnect—environmental. Table 2-1 defines the disconnects, and the following subsections discuss them in more detail. Strategic Disconnect The goal of our security strategies is to shape the future security environment favorably to support our national interests, principles, freedoms, and way of life. However, our nation’s and DoD’s current and future growing dependence on foreign energy sources and the need to ensure their continued availability limit our ability to shape the future security environment. Protecting foreign energy sources will have an increasing impact on DoD’s roles and missions, at the expense of other security needs, potentially dictating the time and place of future conflict if action is not taken to change the trend and mitigate the effects of future reductions in the supply of oil. Operational Disconnect The security and military strategies for DoD require an energy-intense posture for conducting both deterrence and combat operations. The strategies rely on persistent presence globally, mobility to project power and sustain forces, and dominant maneuver to swiftly defeat adversaries. These current and future operating concepts tether operational capability to high-technology solutions that require continued growth in energy sources. Current consumption estimates, although based on incomplete data, validate these increasing fuel requirements and the implications for future operations. Clearly, the skill of our logistics forces in providing fuel has grown significantly since World War II. Still, we must be mindful of the operational implications of logistics requirements. The stalling of General Patton’s Third Army following its campaign across France in August and September 1944 is a telling example of the fuel “tether.” Despite the heroic efforts of logistics forces, the wear and tear on supply trucks and the strategic priority for fuel and logistics support in other areas of operations limited Patton to local operations for nearly 2 months.20 The Defense Energy Support Center (DESC) estimates that 20,000 soldiers are employed to deliver fuel to operations (and spending $1 million per day to transport petroleum, which does not include fuel costs for contractor-provided combat support). The delivery of fuel poses such an operational and tactical risk that in July 2006, Maj. Gen. Richard Zilmer, the highest-ranking Marine Corps officer in Iraq’s Anbar Province, characterized the development of solar and wind power capabilities as a “joint urgent operational need.” General Zilmer cited reductions in often dangerous fuel transportation activities as the main motivation for this request: “By reducing the need for [petroleum-based fuels] at our outlying bases, we can decrease the frequency of logistics convoys on the road, thereby reducing the danger to our Marines, soldiers, and sailors.”21 Operational capability is always the most important aspect of force development. However, it may not be possible to execute operational concepts and capabilities to achieve our security strategy if the energy implications are not considered. Current planning presents a situation in which the aggregate operational capability of the force may be unsustainable in the long term. Fiscal Disconnect The need to recapitalize obsolete and damaged equipment and to develop hightechnology systems to implement future operational concepts is growing. At the same time, the procurement accounts for DoD are constantly under pressure from the rising costs of nondiscretionary accounts in the DoD budget (fuel, manpower) and requirements for non-defense spending (social security, health care). In this pressurized fiscal environment, controlling operating costs is essential to enable the procurement of new capability needs. However, fuel costs and consumption trends are increasing the total operating costs of the force, and projected trends will create the need to make investments in additional logistics capability. Thus, investment for future combat capability must increasingly compete with growing operating costs and logistic support requirements. In addition to the financial planning challenge associated with energy market volatility, the inability to fully account for energy considerations in operational and force development analysis impacts the investment decisions necessary to build the future force. The real cost of fuel to DoD is more than just the DESC standard price used for programming, budgeting, and investment decisions.22 To assess this difference, the Office of Program Analysis and Evaluation (PA&E) has been studying the delivered cost of fuel for the military. PA&E estimated the “wholesale” cost to each service and then added the costs incurred for “retail” delivery as well as other costs incurred by the services and agencies. For a fuel-type dependent standard cost of $2.29 to $2.32 per gallon, PA&E found that the composite costs per gallon are as follows: 􀂡 Air Force JP-8 (weighted cost)—$6.36 air delivery cost (9 percent of total)—$ 42.49 􀂡 Army JP-8—$5.62 (wartime delivered cost not estimated due to variance in mission and escort requirements)23 􀂡 Navy JP-5 (weighted cost at sea)—$3.08 (airborne delivered cost not estimated due to data availability and variance in scenarios) 􀂡 Navy F-76 (weighted cost at sea)—$2.74. The PA&E brief emphasizes that efforts to refine the method and apply fully burdened fuel costs are ongoing and that more focus should be applied to the method than to the specific numbers.24 The inability to estimate potential wartime costs applies a downward bias to these burdened fuel costs.

## FF kills flexibility

### Oil dependence overextends US military and kills readiness

Wald et al 9 (General Charles F Wald, Former Deputy Commander, Headquarters U.S. European Command, General Gordon R. Sullivan, Former Chief of Staff, U.S. Army, and Former Chairman of the CNA MAB, Vice Admiral Richard H. Truly, Former NASA Administrator, Shuttle Astronaut and the ﬁrst Commander of the Naval Space Command, “Powering America’s Defense,” May 2009. <http://www.cna.org/sites/default/files/Powering%20Americas%20Defense.pdf>)

In the U.S., dependence on foreign oil has had a marked impact on national security policies. Much of America’s foreign and defense policies have been deﬁned, for nearly three decades, by what came to be known as the Carter Doctrine. In his State of the Union address in January 1980, not long after the Soviet Union invaded Afghanistan, President Jimmy Carter made it clear that the Soviets had strayed into a region that held “great strategic importance” [33]. He said the Soviet Union’s attempt to consolidate a position so close to the Straits of Hormuz posed “a grave threat to the free movement of Middle East oil.” He then made a declaration that went beyond a condemnation of the Soviet invasion by proclaiming the following: Dependence on foreign oil has had a marked impact on national security policies. The MEND claims it operates to ﬁght environmental and human rights abuses by multinational oil companies and the Nigerian government; critics describe the group as criminal gangs extorting money from oil companies operating in the region [30]. Our aim is not to argue for or against the cause of the MEND, but instead to characterize the impacts these types of groups can have on oil production in unstable regions.PoweringAmericasDefense.org—7 An attempt by any outside force to gain control of the Persian Gulf region will be regarded as an assault on the vital interests of the United States of America, and such an assault will be repelled by any means necessary, including military force. When President Carter made his declaration, the U.S. imported roughly 40 percent of its oil. While the U.S.’s dependence on imported oil dipped below 30 percent in the early 1980s, that percentage has since doubled. In fact, due to the increase in U.S. demand, the total annual volume of oil imported into the U.S. has tripled since the early 1980s [34]. As a result, the stakes are higher, and the U.S. has accordingly dedicated an enormous military presence to ensure the unimpeded ﬂow of oil—in the Persian Gulf and all across the globe. Our Commanders-in-Chief chose this mission not because they want America to be the world’s oil police; they did so because America’s thirst for oil leaves little choice. Inefﬁcient use and overreliance on oil burdens the military, undermines combat effectiveness, and exacts a huge price tag—in dollars and lives.

### Fuel convoys cripple security – are exposed and reduce mobility

Wald et al 9 (General Charles F Wald, Former Deputy Commander, Headquarters U.S. European Command, General Gordon R. Sullivan, Former Chief of Staff, U.S. Army, and Former Chairman of the CNA MAB, Vice Admiral Richard H. Truly, Former NASA Administrator, Shuttle Astronaut and the ﬁrst Commander of the Naval Space Command, “Powering America’s Defense,” May 2009. <http://www.cna.org/sites/default/files/Powering%20Americas%20Defense.pdf>)

Because the burdens of energy use at forward operating bases present the most signiﬁcant energy related vulnerabilities to deployed forces, reducing the energy consumed in these locations should be pursued as the highest level of priority. In the operational theater, inefﬁcient use of energy can create serious vulnerabilities to our forces at multiple levels. The combat systems, combat support systems, and electrical generators at forward operating bases are energy intensive and require regular deliveries of fuel; the convoys that provide this fuel and other necessary supplies are long and vulnerable, sometimes requiring protection of combat systems such as ﬁxed wing aircraft and attack helicopters. Individual troops operating in remote regions are subject to injury and reduced mobility due to the extreme weight of their equipment (which can include up to 26 pounds of batteries).

### Convoys dangerous – key targets for terrorists and reduce combat effectiveness

Wald et al 9 (General Charles F Wald, Former Deputy Commander, Headquarters U.S. European Command, General Gordon R. Sullivan, Former Chief of Staff, U.S. Army, and Former Chairman of the CNA MAB, Vice Admiral Richard H. Truly, Former NASA Administrator, Shuttle Astronaut and the ﬁrst Commander of the Naval Space Command, “Powering America’s Defense,” May 2009. <http://www.cna.org/sites/default/files/Powering%20Americas%20Defense.pdf>)

Supply lines delivering fuel and other supplies to forward operating bases can stretch over great distances, often requiring permission for overland transport through one or more neighboring countries. As these lines grow longer, and as convoys traverse hotly contested territory, they become attractive targets to enemy forces. A Defense Science Board (DSB) task force identiﬁed this movement of fuel from the point of commercial procurement to the point of use by operational systems and forces as a grave energy risk for DoD [35]. Ensuring convoy safety and fuel delivery requires a tremendous show of force. Today, armored vehicles, helicopters, and ﬁxedwing ﬁghter aircraft protect the movement of fuel and other supplies. This is an extraordinary commitment of combat resources, and it offers an instructive glimpse of the true costs of energy inefﬁciency and reliance on oil. Let us be clear here: logistics operations and their associated vulnerabilities are nothing new to militaries; they have always been a military challenge. Even if the military did not need fuel for its operations, some amount of logistics supply lines would still be required to ensure our forces have the supplies they need to complete their missions. However, the fuel intensity of today’s combat missions adds to the costs and risks. As in-theater demand increases, more combat troops and assets must divert to protect fuel convoys rather than directly engage enemy combatants. This reduces our combat effectiveness, but there is no viable alternative: our troops need fuel to ﬁght. The role of energy in impeding military effectiveness has been demonstrated clearly in recent U.S. engagements. When American troops advanced on Baghdad in 2003, highly mobile American forces crossed Iraq with great speed of maneuver. The broad battlespace in their wake required heavy security—the supply convoys bringing new supplies of fuel were constantly under threat of attack. The security measures necessary to defend this vast space slowed American movements and reduced the options available to Army and Marine ﬁeld commanders. It prompted a clear challenge from Marine Lieutenant General James Mattis: “Unleash us from the tether of fuel” [36]. This situation plays out still in Afghanistan, where 3- mile fuel convoys are exposed as they crawl along dangerous mountainous routes. Energy use in the battlespace is a complex matter and often runs counter to conventional wisdom. A study of the 2003 I Marine Expeditionary Force (I MEF) in Iraq found that only 10 percent of its ground fuel use was for the heavy vehicles that deliver lethal force, including M1A1 tanks, armored vehicles, and assault amphibious vehicles; the other 90 percent was consumed by vehicles—including Humvees, 7-ton trucks, and logistics vehicles—that deliver and protect the fuel and forces [37, 38]. It is the antithesis of efﬁ- ciency: only a fraction of the fuel is used to deliver lethal force. A different study showed that, of the U.S. Army’s top ten battleﬁeld fuel users, only two (numbers ﬁve and ten on the list) are combat platforms; four out of the top ten are trucks, many of them used to transport liquid fuel and electric generating equipment [39].

### Inefficiency hurts combat – jeopardizes individual soldiers

Wald et al 9 (General Charles F Wald, Former Deputy Commander, Headquarters U.S. European Command, General Gordon R. Sullivan, Former Chief of Staff, U.S. Army, and Former Chairman of the CNA MAB, Vice Admiral Richard H. Truly, Former NASA Administrator, Shuttle Astronaut and the ﬁrst Commander of the Naval Space Command, “Powering America’s Defense,” May 2009. <http://www.cna.org/sites/default/files/Powering%20Americas%20Defense.pdf>)

The use of electric power extends beyond the battleﬁeld bases: an infantry soldier on a 72-hour mission in Afghanistan today carries more than 26 pounds of batteries, charged by these generators [40]. The weight of the packs carried by these troops (of which 20 to 25 percent can be batteries) hinders their operational capability by limiting their maneuverability and causing muscular-skeletal injuries [41]. Soldiers and marines may not be tethered directly to fuel lines, but they are weighed down by electrical and battery systems that are dangerously inefﬁcient. In 2006, while commanding troops in Iraq’s Al Anbar province, Marine Corps Major General Richard Zilmer submitted an urgent request because American supply lines were vulnerable to insurgent attack by ambush or roadside bombs. “Reducing the military’s dependence on fuel for power generation could reduce the number of road-bound convoys,” he said, adding that the absence of alternative energy systems means “personnel loss rates are likely to continue at their current rate. Continued casualty accumulation exhibits potential to jeopardize mission success” [42]. In response, the Army dispatched its Rapid Equipping Force, which concluded that energy efﬁciency measures would produce the deepest, fastest and most cost-effective reductions in electricity, and hence fuel, demand [43]. It would reduce risks and save lives. The DSB came to the same conclusion, issuing stark warnings about the burden of fuel in two reports in 2001 and 2008 [35, 44].

### Terrorists target convoys – need for convoy protection massively reduces military capability

Leber 9 (Jessica, ClimateWire correspondent with Congress, “Pentagon: Riding a Wave of Culture Change, DOD strives to trim energy demand,” *E and E News,* 7/20/09. <http://www.eenews.net/public/climatewire/2009/07/20/1>) SV

The Army's fuel consumption rose more than 10 times between recent peace and wartime periods, said Shaffer. The difference lies in the 20,000 tankers carrying fuel to deployed troops. Fuel convoys have become prime targets for insurgents and their improvised explosives, feeding a cycle that diverts more man and equipment power to protect the supply lines. According to a recent report by the Center for Naval Analyses, a military think tank, the 2003 Marine Expeditionary Force in Iraq burned 90 percent of its ground fuel in the very vehicles needed to deliver and protect the remaining 10 percent. According to Shaffer, nearly three-quarters of what convoys move in Afghanistan's treacherous terrain is fuel or water. And an infantryman on a 24-hour foot mission will need to carry 30 to 40 pounds of batteries for the power-hungry equipment he's hauling, slowing the soldier down and increasing his exposure. The vulnerability of the domestic electric grid, the growing threat of climate change, and the prospect of energy being deployed as a "strategic weapon" by countries that control its supply are all additional drivers for change. But the motives weren't always so obvious. It wasn't really until the late 1990s that a few in DOD leadership began to question the department's use of fuels in combat, according to Tom Morehouse, a consultant who helped draft the resulting Defense Science Board report. The more fuel and water are needed, the more soldiers and civilians are put in danger guarding these supplies. Courtesy of U.S. Army. If the Abrams tanks used in Operation Desert Shield -- the U.S. mission to strategically protect Saudia Arabia's oil reserves from Saddam Hussein -- were 50 percent more fuel efficient, the military's buildup might have taken five months instead of six, its study noted. For the first time, Morehouse said, insiders were linking energy consumption to the military's "mission" effectiveness, an argument that would get leadership's attention. Every solider driving a fuel truck is one less with a rifle in his hand, as Morehouse puts it. And if planners added up the "fully burdened cost of fuel" -- the price of all the convoys, soldiers, and equipment dedicated to moving and protecting supply lines -- efficiency investments might not seem so expensive, the Defense Science Board argued. Iraq: an energy wake-up call That was 2001. "And then September came, and the world changed," remembered Morehouse. "The report got put on the shelf." Fast-forward five years. U.S. causalities were growing in Iraq as insurgents targeted vulnerable fuel supply convoys, so much that Maj. Gen. Richard Zilmer, U.S. commander in the Al Anbar province of Iraq, put out an urgent request for renewable power supplies. DOD leaders cite this as a wake-up call because it came straight from the front lines. Meanwhile, oil prices were beginning to spike. Delivering fuel to the battlefield aboard an aircraft tanker cost more than $40 a gallon in 2006. The Pentagon was caught unprepared.

### Energy inefficiency stalls troop movement – international pollution regulation

Nagl and Parthemore in 10 (John, president of the Center for New American Security, and Christine, fellow at the Center for New American Security, “Fueling the Future Force,” *Center for the New American Security*, September 2010. <http://www.cnas.org/files/documents/publications/CNAS\_Fueling%20the%20Future%20Force\_NaglParthemore.pdf>)

Signs indicate that federal and state governments will continue to push for greater adoption of domestic and/or lower-carbon energy technologies. As a result, DOD will face a changing legal, regulatory and political environment in the coming decades. Congress has consistently passed legislation since 2005 to support investments and set federal requirements supporting energy efficiency and renewable energy production. The Obama administration strongly supports this approach as well. Obama issued an October 2009 Executive Order committing federal agencies to calculate and reduce their greenhouse gas emissions, which spurred energy-focused DOD officials to begin complying with this requirement. Likewise, 27 states have instituted renewable energy portfolio standards, and nine others have renewable or alternative energy goals or requirements.18 Legal and regulatory changes can also constrain energy choices. For instance, the U.S. Supreme Court ruled in 2007 that greenhouse gas emissions constitute a pollutant and therefore can be regulated at the federal level, and the Obama administration has signaled its intent to move forward with such regulation unless the Congress mandates emissions reductions through legislation. While the U.S. government sets domestic regulations and laws, and can exempt combat-related activities, it does not exercise the same control internationally. Indeed, there is growing concern that foreign countries may not always exempt military activities within their territory from environmental standards. For example, the Canadian government recently decided to upgrade one of its vessels that was not equipped to meet the environmental standards of several European countries, for fear that the vessel could be denied port access.19 The Department of Defense must consider emerging international trends in regulating emissions and adopting less carbon-intensive energy sources as it considers how to guarantee its freedom of access to foreign ports and territories.

## FF 🡪 vulnerabilities

### DOD Petroleum reliance kills heg-Corrupt Supply Holders and Resource Vulnerability

Parthemore & Nagl 10 (Christine Parthemore, Fellow at the Center for New American Security, John Nagl, President of the Center for New American Security, “Fueling the Future Force: Preparing the Department of Defense for a Post-Petroleum Era”, http://www.cnas.org/node/5023, September 2010) SV

Several factors challenge DOD’s continued reliance on its existing petroleum-dominant energy strategy over the long term: direct risks to U.S. security; troubling supply and demand trends; the often-hidden external costs of fuel consumption; and a changing domestic political and regulatory environment. The Risks of Petroleum Dependence: The growing world demand for petroleum presents major geostrategic risks. High prices and rising demand are a boon to major suppliers and reserve holders such as Iran and Venezuela, which are unfriendly to the United States. It also affects the international behavior of rising powers such as China, which is on a quest to secure access to natural resources that is in turn expanding its influence around the globe. In Mexico, one of the top suppliers of petroleum to the United States, pipelines serve as an increasingly attractive target for dangerous cartels to fund activities that could undermine the Mexican government, destabilize the region and decrease U.S. homeland security.4 American foreign policy itself has been colored by its growing petroleum demands since the 1970s oil crises and subsequent declaration of the Carter doctrine, which stipulated that the United States would consider threats to the Persian Gulf region threats to its “vital interests” due to the strategic importance of its petroleum reserves.5 Dependence on petroleum for 94 percent of transportation fuel is also a dangerous strategic risk for the United States given the leverage oil can provide to supplier countries. Many European allies have experienced such leverage in action with Russia periodically threatening to reduce or cut off natural gas exports to countries highly reliant on their supplies (and in some cases carrying through with these threats). Similarly, national oil companies and OPEC can choose to increase or decrease their production rates to drive changes in the market. The more the United States reduces its dependence on petroleum, the better it can hedge against petroleum suppliers exerting political leverage over U.S. interests, including in times of crisis. At the operational level, heavy reliance on liquid fuels also constitutes a force protection challenge for DOD. Fuel supply convoys have been vulnerable to attack in both Iraq and Afghanistan, where the services have struggled to adapt to the challenges of terrorism, insurgency and violent extremism. In addition to minimizing these risks in the current wars, DOD must also conceptualize and plan for what the future will likely hold for America’s security. The Navy’s battle against pirates off the coast of the Horn of Africa foreshadows the littoral and unconventional challenges that await the United States in the coming decades, as populations continue to migrate toward the world’s coastal area. These types of problems often manifest at major shipping chokepoints (including petroleum transit chokepoints), and addressing them will include distinctive fueling requirements. The Air Force, likewise, confronts dramatic changes in manned and unmanned flight, in addition to the proliferation of space technologies, all of which could dramatically alter fuel needs. In another example, one recently published AirSea battle concept focused on China notes that the type of conflict it outlines could require hardening fueling infrastructure, improving aerial refueling, “stockpiling petrol, oil, and lubricants” and potentially “running undersea fuel pipelines between Guam, Tinian and Saipan.”6 As the character of warfare changes, DOD will have to continue to consider the attraction of fuel supply lines to opponents.

### Dependence on foreign oil leaves critical vulnerabilities – military not prepared for energy-scarce world

Hornitschek et al 8 (Mike, Colonel and military researcher - USAF, Coyote Smith – colonel and scientist - USAF, Paul Demphouss – Lt. Colonel USMC, “Strategic Importance,” Ad Astra Spring 2008. <http://www.nss.org/adastra/AdAstra-SBSP-2008.pdf>)

The very real risks of climate change, energy nationalism and scarcity, unconstrained technology explosion, and potential resource conflicts weigh heavily on the futurist minds of the action officers of the Air Force Future Concepts and Transformations Office and National Security Space Office (NSSO) “Dreamworks.” These officers are charged with visualizing the world 25-or-more years from now, and informing and guiding Air Force and space strategy development. For a military that is fundamentally dependent on high-energy capabilities to protect its nation and the international commons for the good of all humanity, not only are the strategic risks associated with energy scarcity that lie ahead great, but so too are the operational and tactical vulnerabilities for the finest war-fighting and peacekeeping machine humans have ever known. It was from within this Air Force policy incubator and the NSSO that the spark to reexamine SSP as a strategic, operational, and tactical energy solution was struck. Beginning in the 1970s through 2001, the SSP was examined on multiple previous occasions by the Department of Energy (DOE) and NASA, but failed to find a champion in large part because SSP fell between organizational gaps (DOE does energy but not space, and NASA does space, not energy). On the other hand, because of its unique mission, DoD is the first government agency that will have to deal with the harsh realities of a coming energy peak. Self-developed, complex modern weapon systems spend two decades in pre-production and another five in operation—a 70-year life cycle that clearly places any new platforms (and our entire war-fighting doctrine) squarely on the backside of peak oil, and permanently in a hangar unless DoD can reinvent itself to remain relevant in an energy scarce world. Therefore, DoD is in a position of greatest need for examining all alternate energy options. On a more tactical level, the very real high cost in dollars and lives lost to deliver large quantities of fuel and energy supporting operations in Iraq and Afghanistan has informed the military that energy logistics is a reality that begs for a paradigm change.

### Supply lines being shut down by route closures – only SBSP avoids fuel tether vulnerabilities

Dinerman 8 (Taylor, journalist at the Space Review “Space solar power and the Khyber pass,” The Space Review, 11/24/08. <http://www.thespacereview.com/article/1255/1> )

For the second time this year the Pakistani government temporarily shut the main US and NATO supply route from the port of Karachi to Afghanistan. This has exposed the US’s biggest weakness, our dependence on a weak and corrupt Pakistani government for access to the theater of operations. The main problem is not food, ammunition, or equipment—in an emergency those can be carried in transport aircraft—but energy, specifically fuel. In the longer run Pakistan’s closure of the Khyber Pass supply route justifies investment in SSP as a technology that landlocked nations can use to avoid the pressures and threats that they now have to live with. Last year the National Security Space Office released its initial report on space solar power (SSP). One of the primary justifications for the project was the potential of the system to provide power from space for remote military bases. Electrical power is only part of the story. If the military really wants to be able to operate for long periods of time without using vulnerable supply lines it will have to find a new way to get liquid fuel to its forward operating forces. This may seem impossible at first glance, but by combining space solar power with some of the innovative alternative fuels and fuel manufacturing systems that are now in the pipeline, and given enough time and effort, the problem could be solved. The trick is, of course, to have enough raw energy available so that it is possible to transform whatever is available into liquid fuel. This may mean something as easy as making methanol from sugar cane or making jet fuel from natural gas, or something as exotic as cellulosic ethanol from waste products. Afghanistan has coal and natural gas that could be turned into liquid fuels with the right technology. What is needed is a portable system than can be transported in standard containers and set up anywhere there are the resources needed to make fuel. This can be done even before space solar power is available, but with SSP it becomes much easier. In the longer run Pakistan’s closure of the Khyber Pass supply route justifies investment in SSP as a technology that landlocked nations can use to avoid the pressures and threats that they now have to live with. Without access to the sea, nations such as Afghanistan are all too vulnerable to machinations from their neighbors. Imagine how different history would be if the Afghans had had a “Polish Corridor” and their own port. Their access to the world economy might have changed their culture in positive ways. Bangladesh and Indonesia are both Muslim states whose access to the oceans have helped them adapt to the modern world.

### Lack of oil cripples national defense – domestic energy and combat situations

Wald et al 9 (General Charles F Wald, Former Deputy Commander, Headquarters U.S. European Command, General Gordon R. Sullivan, Former Chief of Staff, U.S. Army, and Former Chairman of the CNA MAB, Vice Admiral Richard H. Truly, Former NASA Administrator, Shuttle Astronaut and the ﬁrst Commander of the Naval Space Command, “Powering America’s Defense,” May 2009. <http://www.cna.org/sites/default/files/Powering%20Americas%20Defense.pdf>)

Energy for America’s transport sector depends almost wholly on the reﬁned products of a single material: crude oil. Energy for homes, businesses, and civic institutions relies heavily on an antiquated and fragile transmission grid to deliver electricity. Both systems—transport and electricity—are inefﬁcient. This assessment applies to our military’s use of energy as well. Our defense systems, including our domestic military installations, are dangerously oil dependent, wasteful, and weakened by a fragile electrical grid. In fact, the Department of Defense (DoD) is the largest single energy consumer in the nation. In our view, America’s energy posture constitutes a serious and urgent threat to national security—militarily, diplomatically, and economically. This vulnerability is exploitable by those who wish to do us harm. America’s current energy posture has resulted in the following national security risks: • U.S. dependence on oil weakens international leverage, undermines foreign policy objectives, and entangles America with unstable or hostile regimes. • Inefﬁcient use and overreliance on oil burdens the military, undermines combat effectiveness, and exacts a huge price tag—in dollars and lives. • U.S. dependence on fossil fuels undermines economic stability, which is critical to national security. • A fragile domestic electricity grid makes our domestic military installations, and their critical infrastructure, unnecessarily vulnerable to incident, whether deliberate or accidental.

## SBSP solves Flexibility

### SBPS aids agile combat – eliminates the largest bulk of support equipment and minimizes chance of discovery

Ramos 2k (Kim, USAF Major and professor at the Air Command and Staff College Air University, “Solar Power Constellations Implications for the US Air Force.” April 2000. <https://www.afresearch.org/skins/rims/q\_mod\_be0e99f3-fc56-4ccb-8dfe-670c0822a153/q\_act\_downloadpaper/q\_obj\_73510976-ad5e-4d5d-a51c-a7103406f67d/display.aspx?rs=enginespage>) SV

Power relay satellites, a stepping stone to full solar power satellites, could supply power to deployed locations and be part of focused logistics and agile combat support. Part of the deployment planning process would be identifying the nearest power relay satellite, the coordinates for the reflecting dish, and the amount of power required by the site. The next step, after demonstrating sites powered by a relay satellite, would be employing solar power satellites instead of relaying electricity across the globe. Using power beamed from a relay station or a solar power satellite could eliminate the power generating part of a deployment and reduce airlift. Incorporating the rectenna or the receiving part of the beam into camouflage netting or into tent tarps creates no additional infrastructure. For example, a typical joint task force communications unit for a bare base deployment requires the generators in Table 1 to supply power for the communications equipment and site. According to the Computer Aided Load Manifest software, used by logistics planners, to bring the generators into theater requires one C-17 or two C-141s. A Kenney Battlelab initiative on replacing aerospace ground equipment recommended alternative sources of power for airfield operations. In the report, it states power producing equipment “is repeatedly singled-out through after action reports … as the number one airlift intensive requirement for Air Expeditionary Force deployment.” 12 The report recommends adopting fuel cell technology to solve the problem, however, solar power satellites or power relay satellites are also viable options. In addition to reducing airlift, using power from a satellite would reduce the fuel required for generators, minimize hazardous emissions and waste, reduce heat signatures, and eliminate a plethora of support equipment, war readiness spares kits, tools, and spillage clean up kits.

### SBSP improves energy flex – air platforms and communications

NSSO, 2007, SBSP Study Group, 2007, 10 October 2007, (National Security Space Office, Space-Based Solar Power, As an Opportunity for Strategic Security, Phase 0 Architecture Feasibility Study, http://www.acq.osd.mil/nsso/solar/SBSPInterimAssessment0.1.pdf)

Several applications are possible.  For instance, beamed power in space may be useful in reducing the size, weight, and drag of satellites in a constellation by lowering the size of their on‐board solar panels and weight of their power and battery systems.  Beaming power for in‐space propulsion purposes may have similar requirements if high electric power is required, but far different requirements if being used for rapid thermal expansion of propellants. • Terrestrially, SBSP is most interesting on large scales for high capacity factor baseload power, and input power for the manufacture of synfuels.  If receivers are located near to populated areas and sensitive ecosystems, low power density and non‐interfering frequencies ranges are desired.    • For lower power levels, three terrestrial applications are of interest.  First, providing limited amounts of electrical power to remote forward locations would likely require smaller receivers and may have relaxed intensity standards.  Second, providing power to long‐duration airborne platforms for their payloads and station‐keeping requires exquisite tracking and pointing, but may relax the end‐to‐end efficiency.  Finally low intensity broadcast power for the purpose of providing trickle‐charge to electronic components such as communications gear, individual soldiers, or remote sensors and their batteries requires very small receivers and very low density broadcast.

## Flex key to heg

### Flexibility is key to Military Readiness

**Schreier & Caparini 5** (Fred Schreier, Consultant with the Geneva Center for Arms Control and Swiss Ministry of Defense, Marina Caparini, Senior Fellow at the Geneva Center for Amrs Control, “Privatising Security: Law, Practice and Governance of Private Military and Security Companies”, http://se2.dcaf.ch/serviceengine/Files/DCAF/18346/ipublicationdocument\_singledocument/BA695123-3145-4CAA-B29A-A60711724C96/en/op06\_privatising-security.pdf) SV

The “ideal battlespace” would not contain any civilians. The presence of noncombatants as well as “civilians authorized to accompany the force” in the area of operations greatly complicates the life of a commander. Complexity is compounded when the commander is dependent upon PMCs to accomplish his mission. From an operational perspective, outsourcing is supposed to improve flexibility and relieve pressures on support personnel. However, one of the most obvious downsides of going into the battle with civilians is the loss of **flexibility – one of the key tenets of successfully waging war. A commander’s freedom and ability to improvise quickly in using tactics, employing weapons, and deploying personnel have long been considered essential to victory in combat. Flexibility is equally essential for effective logistics performance – adapting logistics structures and procedures to changing situations, missions, and concepts.** To resolve the challenges inherent in using contractors, the commanders must have information and awareness of contractors working in and around their areas of responsibility. Maintaining visibility of contractors and coordinating their movements are vital if the commander is to manage his available assets and capabilities efficiently and effectively. However, this visibility is difficult to establish since contractors are not really part of the chain of command and, in general, are not subject to the same orders that apply to soldiers regarding good order and discipline.133 And commanders have no easy way to get answers to questions about contractor support.134 Lack of information and awareness of PMCs or PSCs and their presence in supporting combat operations tend to result in: gaps in doctrine regarding who is responsible for securing lines of communication used by commercial suppliers; loss of visibility of assets moving in and around the theatre of operations; loss of control of contractor personnel and equipment; increased force responsibility for supporting contractor personnel in the areas of life support, force protection, housing, medical care, transportation, and operational and administrative control; use of additional manpower, material, and funding resources to support contractor personnel; concern about the availability of commercial supplies and services in a hostile environment; and gaps in providing logistics support if commercial supply lines become disrupted.135 In addition, Status of Forces Agreements and other arrangements with host nations may complicate the commander’s situation by restricting entry, movement, and action of PMCs and PSCs.

### Military power is critical to maintain Heg

Hartman 8 (Thomas Hartman, Department of Political Science at University of California, http://www.allacademic.com/one/www/research/index.php?cmd=Download+Document&key=unpublished\_manuscript&file\_index=13&pop\_up=true&no\_click\_key=true&attachment\_style=attachment&PHPSESSID=fa567ae4f20db2ce78dafbe0bca882c8, 2008) SV

Literature today suggests there is an existing relationship between the military prestige of a state and its impact on attracting foreign government elites.25 Realists have noted that a hegemonic power can utilize its military and economic resources to coerce, provide financial support, or exchange cultural values for the purpose of building for itself a positive image.26 Similarly, with military power a state can alter the ideals and interests of policymakers in other countries. As they note, instruments traditionally used for coercive purposes can ―generate shared beliefs in the acceptability or legitimacy of a particular international order.‖27 It is therefore no surprise that the military organization has played an integral part of shaping, promoting, and protecting American national security interests. Most importantly, through the exchange of military training, technology, and alliance activities, trust in American normative beliefs among foreign military leaders, politicians, and their populations is formed, leading to an increased understanding of legitimacy in American foreign affairs.

## FF kills Rapid Response/Effectiveness

### Energy needs limit speed and maneuverability

MCEEO 10 (Marine Corps Expeditionary Energy Office, “Marine Corps Expeditionary Energy Strategy and Implementation Plan,” March 9, 2010. <http://www.marines.mil/unit/hqmc/cmc/Documents/USMC%20Expeditionary%20Energy%20Strategy.pdf>)

Energy is an essential combat enabler and a critical vulnerability . The way we have brought the fight to the enemy has yielded success on the battlefield . It has also created unprecedented demands for fuel and sources located in volatile regions of the world . Over the last ten years, we have become more lethal, but we have become and water that tether Marines to long logistic tails and limit our ability to maneuver as an expeditionary force . At a strategic level, our dependence on fossil fuels exposes us to a supply chain with constantly fluctuating prices, and petroleum supply routes heavy . We have lost speed . To reset the balance, we must return to our Spartan roots—fast, lethal, and austere.

### Logistics tails kill rapid response – the need for oil hobbles maneuverability

Karbuz 4/9 (Sohbet, research associate at the International Energy Agency in Paris, “The US Marine Corps and Energy,” Sohbet Karbuz, April 9, 2011. <http://faceturk.org/the-us-marine-corps-and-energy.html>)

Fuel requirement limits range and freedom of maneuver. Tethered to fuel, Marines have lost speed. Marines in Afghanistan use more than 200,000 gallons of fuel a day. Of this 75% was consumed by ground forces, which includes use by vehicles, generators, and other sustainment equipment. Aircraft consumed approximately 25% of the total. Of the 75% consumed by ground forces, a significant portion is used to generate electricity. Each of the more than 100 forward operating bases in Afghanistan requires a daily minimum of 300 gallons of diesel fuel. The Marine Corps announced on 21 March 2011 its Expeditionary Energy Strategy. The strategy spans the full spectrum of Marine operations. Spanning Bases to Battlefield, the strategy centers on changing the way marines think about energy. Setting the course to move from paper to action, it also includes an Implementation Plan which sets goals, performance metrics for expeditionary and installations energy, and a plan for implementation by 2025. In the words of General James F. Amos “Our growing demand for liquid logistics comes at a price. By tethering our operations to vulnerable supply lines, it degrades our expeditionary capabilities and ultimately puts Marines at risk. To maintain our lethal edge, we must change the way we use energy. The current and future operating environment requires an expeditionary mindset geared toward increased efficiency and reduced consumption, which will make our forces lighter and faster. We will aggressively pursue innovative solutions to reduce energy demand in our platforms and systems, increase our self-sufficiency in our sustainment, and reduce our expeditionary foot print on the battlefield. Transforming the way we use energy is essential to rebalance our Corps and prepare it for the future.” Energy is an essential combat enabler and a critical vulnerability due to long logistic tails. Marines list the following key elements for success: (1) to aggressively pursue innovative solutions to reduce energy demand in platforms and systems, (2) to increase self-sufficiency in sustainment, and (3) to reduce expeditionary foot print on the battlefield.

### Energy freedom is key to combat power – petroleum dependency limits command, control and communication

Brookings 7 (Brookings Institute, “Department of Defense Energy Strategy: Teaching an Old Dog New Tricks,” 21st Century Defense Initiative, Foreign Policy Studies, August 2007. <http://www.brookings.edu/~/media/files/rc/papers/2007/08defense\_lengyel/lengyel20070815.pdf>)

First, the DOD needs to recognize the problem from a military perspective: energy is the key enabler of US military combat power. With that comes huge consumption of mostly imported petroleum based fuels, a command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) structure dependent on the civilian electrical grid, and rising costs to support the military’s energy needs. Despite those key elements, DOD has no comprehensive strategy for energy or organizational structure to implement an energy strategy. Second, the DOD must recognize that energy security makes the military vulnerable in several ways. DOD operations require assured access to large amounts of fuel for combat platforms and electricity for DOD installations from a vulnerable electrical grid. Recent cost increases and higher projected costs for energy take defense dollars away from other key budget areas. Energy requirements are directly related to combat effectiveness, and the infrastructure required to transport and distribute energy to the battlefield is extremely expensive and diverts resources away from combat. Combat forces are limited by a “tether of fuel” that needs to be lengthened. Third, energy must be managed like other combat enablers, such as intelligence, acquisition, and logistics. Present DOD fuel costs represent only a 2.5 – 3% fraction of the national defense budget. That may seem small, but in a fiscally constrained wartime environment where DOD and Service budgets have been cut again and again – every dollar is already committed. The forecast is for more of the same. An already huge national debt, federal budget deficits, a looming fiscal storm of rising national health care costs and a potential Social Security crisis make fiscally constrained times appear permanent for the US Government.

### The fuel tether limits freedom of movement and rapid response – jacks mission execution

MCEEO 10 (Marine Corps Expeditionary Energy Office, “Marine Corps Expeditionary Energy Strategy and Implementation Plan,” March 9, 2010. <http://www.marines.mil/unit/hqmc/cmc/Documents/USMC%20Expeditionary%20Energy%20Strategy.pdf>)

All of these warfighting assets have made our combat forces more lethal but with a grave unintended consequence – our logistics trains are at greater risk . [14] Fuel and water must be trucked into Afghanistan over long distances through difficult terrain and challenging weather conditions . Convoys, vulnerable to asymmetric and conventional attack and disruption, are exposed targets that increase mission risk and divert combat power for protection that could otherwise be employed in operations against the enemy . And, in paying for fuel transit, we run the risk of indirectly funding our adversaries . [15] [16] Furthermore, supplying the Marine Air-Ground Task Force’s (MAGTF) growing energy requirement strains sustainment planning and execution at all levels of war—tactical, operational, and strategic . [17] Our fuel requirement limits our range and freedom of maneuver from the sea and on land . It constrains our tactical options for executing missions in complex battlespaces, across long distances, and against hybrid threats . Tethered to fuel, we have lost speed.

## Rapid Response key to heg

### Rapid response key to deterrence and compellance

http://www.hks.harvard.edu/cchrp/maro/pdf/MARO\_Handbook\_4.30.pdf

FDOs include Diplomatic, Informational, Military, and Economic (DIME) actions, and are primarily intended to dissuade an adversary from taking an undesired action. They may also go further to compel the adversary to stop or limit his actions. This Handbook retains the term “Flexible Deterrent Options” when discussing actions prior to the main MARO intervention, even though some of these actions may not simply “deter,” but could also “prevent” or “compel.” There may be a gray area between FDOs and an intervention, and a MARO could evolve incrementally. Military FDOs are most effective when they are done in combination and concert with non-military measures. 44 Military FDOs could be employed during any phase of the intervention and may include shows of force, preparations for future operations, or actual operational missions. They may be lethal or non-lethal and may be positive or threatening in nature. National authorities can be presented with a menu of FDOs to choose from, along with any associated risks. Combatant Command or relevant MARO force commanders will likely be required to provide input and recommendations regarding the use of military FDOs. FDO objectives may include exposing perpetrator actions to international scrutiny, establishing credibility of a potential intervention, building capability for a potential intervention, protecting potential victims, dissuading or punishing perpetrators, isolating the perpetrators, or building and demonstrating international resolve.

## FF undermine Basing

### Current bases can’t handle critical loads – generators can only supply short-term outages

DSBTF 8 (Defense Science Board Task Force on DoD Energy Strategy, “More Fight – Less Fuel,” February 2008. <http://www.acq.osd.mil/dsb/reports/ADA477619.pdf>)

Historically, the mission of DoD installations has been to train combat forces and deploy them when needed. Critical missions at most installations were limited to those needed to execute the deployment of forces. In the event commercial electric power failed, small diesel generators with short-term fuel supplies were adequate to power those activities. Installations with substantial Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) and military strategic deterrence missions have higher mission criticality and greater power requirements. Backup power systems at these installations are larger, but are still based on diesel generators and fuel supplies sized for only short-term commercial outages and seldom properly prioritized to critical loads because those are often not wired separately from non-essential loads. DoD’s approach to providing power to installations is based on assumptions that commercial power is highly reliable, subject to infrequent and short term outages, and backup can meet demands. Unfortunately, DoD’s assumptions about commercial power and other critical infrastructure reliability are no longer valid and DoD must take a more rigorous risk-based approach to assuring adequate power to its critical missions. 5.2 A Confluence of Events Adds to Already Unacceptable Risks Critical missions at DoD installations have expanded significantly in recent years. During Hurricane Katrina, military installations became central to recovery efforts in three key ways: by serving as the base of operations for relief and rescue missions using military assets; as the central command and control hubs to coordinate the work of other deployed national resources; and as a source of skilled personnel to provide rescue, recovery, medical and other emergency services required by survivors. 25 Under DoD’s new homeland defense mission, military installations would serve a similar function in the event of a terrorist attack on the homeland, becoming operational bases in theater. 26 As a result, a much larger portion of the installation becomes a critical mission requiring highly reliable power. This drives a fundamental rethinking of what it means to provide power to these installations. Similarly, C4ISR and strategic deterrence missions have taken on new real-time tactical and strategic criticality. They directly support real-time operations, and must be an uninterrupted, dependable, credible and trusted source of command, control and execution capability. As a result, their power requirements and need for resiliency have also increased. 27 For various reasons, the grid has far less margin today than in earlier years between capacity and demand. The level of spare parts kept in inventory has declined, and spare parts are often co-located with their operational counterparts putting both at risk from a single act. In some cases, industrial capacity to produce critical spares is extremely limited, available only from overseas sources and very slow and difficult to transport due to physical size. 28 In many cases, installations have not distinguished between critical and non-critical loads when configuring backup power systems, leaving critical missions competing with non-essential loads for power. The Task Force finds that separating critical from noncritical loads is an important first step toward improving the resilience of critical missions using existing backup sources in the event of commercial power outage. The confluence of these trends, namely increased critical load demand, decreased resilience of commercial power, inadequacy of backup generators, and lack of transformer spares in sufficient numbers to enable quick repair, create an unacceptably high risk to our national security from a long-term interruption of commercial power.

## SBSP solves Basing

### SBSP development is key to FOBs and US dominance

Rouge 7 (Director at National Security Space office, “Space-Based Solar Power as an Opportunity for Strategic Security”, http://www.scribd.com/doc/8736624/SpaceBased-Solar-Power-Interim-Assesment-01, 10/10/07) SV

FINDING: The SBSP Study Group found that the U.S. Department of Defense (DoD) has a large, urgent and critical need for secure, reliable, and mobile energy delivery to the war-fighter. When all indirect and support costs are included, it is estimated that the DoD currently spends over $1 per kilowatt hour for electrical power delivered to troops in forward military bases in war regions. OSD(PA&E) has computed that at a wholesale price of $2.30 a gallon, the fully burdened average price of fuel for the Army exceeds $5 a gallon. For Operation IRAQI FREEDOM the estimated delivered price of fuel in certain areas may approach $20 a gallon. Significant numbers of American servicemen and women are injured or killed as a result of attacks on supply convoys in Iraq. Petroleum products account for approximately 70% of delivered tonnage to U.S. forces in Iraq—total daily consumption is approximately 1.6 million gallons. Any estimated cost of battlefield energy (fuel and electricity) does not include the cost in lives of American men and women. The DoD is a potential anchor tenant customer of space-based solar power that can be reliably delivered to U.S. troops located in forward bases in hostile territory in amounts of 5-50 megawatts continuous at an estimated price of $1 per kilowatt hour, but this price may increase over time as world energy resources become more scarce or environmental concerns about increased carbon emissions from combusting fossil fuels increases. FINDING: The SBSP Study Group found that the SBSP development would have a transformational, even revolutionary, effect on space access for the nation(s) that develop(s) it. SBSP cannot be constructed without safe, frequent (daily/weekly), cheap, and reliable access to space and ubiquitous in-space operations. The sheer volume and number of flights into space, and the efficiencies reached by those high volumes is game-changing. By lowering the cost to orbit so substantially, and by providing safe and routine access, entirely new industries and possibilities open up. SBSP and low-cost, reliable space access are co-dependent, and advances in either will catalyze development in the other.

\*\*\*NOTE: FOB-Forward Operating Base

### SBSP enables surveillance and eliminates convoys

NSSO, 2007, SBSP Study Group, 2007, 10 October 2007, (National Security Space Office, Space-Based Solar Power, As an Opportunity for Strategic Security, Phase 0 Architecture Feasibility Study, http://www.acq.osd.mil/nsso/solar/SBSPInterimAssessment0.1.pdf)

For the DoD specifically, beamed energy from space in quantities greater than 5 MWe has the potential to be a disruptive game changer on the battlefield.  SBSP and its enabling wireless power transmission technology could facilitate extremely flexible “energy on demand” for combat units and installations across an entire theater, while significantly reducing dependence on vulnerable over‐land fuel deliveries.   SBSP could also enable entirely new force structures and capabilities such as ultra long‐endurance airborne or terrestrial surveillance or combat systems to include the individual soldier himself.  More routinely, SBSP could provide the ability to deliver rapid and sustainable humanitarian energy to a disaster area or to a local population undergoing nation‐building activities.  SBSP could also facilitate base “islanding” such that each installation has the ability to operate independent of vulnerable ground‐ based energy delivery infrastructures.  In addition to helping American and Allied defense establishments remain relevant over the entire 21 st Century through more secure supply lines, perhaps the greatest military benefit of SBSP is to lessen the chances of conflict due to energy scarcity by providing access to a strategically security energy supply.

### SBSP protects FOBs – no need for fuel convoys

Lemonick 9 (Michael D, senior writer at Climate Central and TIME, professor of science journalism at Princeton, author, “Solar Power from Space: Moving Beyond Science Fiction,” *Yale Environment 360* 8/31/09. http://e360.yale.edu/content/feature.msp?id=2184)

But the military’s interest in SBSP could give a major boost to the technology. According to Marine Corps Lt. Col. Paul Damphousse, Chief of Advanced Concepts for the National Security Space Office, the military is interested in SBSP for two main reasons. The first, he said, is that “we’re obviously interested in energy security, and by being an early customer, the government can rapidly accelerate development of the technology. we’re also interested in weaning ourselves off fossil fuels because climate change could pose national security risks.” But there would also be a tactical advantage to space-based solar, Damphousse noted. When the military is operating in remote regions of countries like Iraq or Afghanistan, it uses diesel generators to supply forward bases with power. “We have a significant footprint getting energy in,” says Damphousse, noting the need for frequent convoys of oil tankers, the soldiers to protect them, and air support — all of which is expensive and dangerous. Being able to tap into power beamed directly down from space would clearly have a lot of appeal, says Damphousse, even if it were relatively costly. And it’s not just useful for the battlefield, he says, but also for areas affected by natural disasters, such as Hurricane Katrina.

### SBSP solves FOB issues and is reliable

Singer 7 (Jeremy Singer, Staff Writer at Space in MSNBC, “Pentagon may study space-based solar power”, http://www.msnbc.msn.com/id/18056610/ns/technology\_and\_science-space/t/pentagon-may-study-space-based-solar-power/, 4/11/07) SV

The officials said the study does not mean that the military plans to demonstrate or deploy a space-based solar power constellation. However, as the Pentagon looks at a variety of alternative energy sources, this could be one possible method of supplying energy to troops in bases or on the battlefield, they said. The military’s work in this area also could aid development of a system that could provide energy to non-military users as well, according to Lt. Col. Michael Hornitschek, chief of rated force policy on the Air Force staff at the Pentagon. Hornitschek, who has been exploring the concept of space-based solar power in his spare time, recently briefed the NSSO on the concept of space-based solar power, and stimulated interest in conducting a formal study, according to Lt. Col. M.V. “Coyote” Smith, chief of future concepts at the NSSO. The NSSO would need to find the financial resources and available manpower to conduct the study, Smith said. Hornitschek would lead work on the study on behalf of the NSSO if the NSSO elects to pursue it, and he said he hopes that a system could be deployed in roughly 20 years. The ability to constantly gather solar energy would allow a space-based system to avoid safety concerns to other satellites or people on the ground by constantly transmitting energy to Earth at a level that is high enough to be useful but low enough so as not to cause any damage, said Mankins, a former NASA official who previously served as manager of advanced concept studies at NASA headquarters before leaving the agency in 2005.

\*\*\*NOTE: FOB-Forward Operating Base

## Basing impacts

### Only FOBs exert air and naval power – prevent Sino-Taiwan war

Martin 5 (Colonel Lawrence M, USAF, “Countering a Strategic Gambit: Keeping US Airpower Employable in a China-Taiwan Conflict,” Air and Space Power Journal, Fall 2005. <http://www.airpower.maxwell.af.mil/airchronicles/apj/apj05/fal05/martin.html>)

America’s coercive capability in a potential PRC-Taiwan conflict depends on its ability to deploy and employ both naval and air forces for sustained operations in the skies and waters over and around Taiwan. Those deployments will depend on access to regional bases, its ability to deploy and then sustain the force at these bases, and the willingness (or unwillingness) of America’s regional allies to support and assist an intervention. Deployments could be limited by American commitments to other theaters, as the United States must weigh its ability to maintain forces to other theaters while mounting a credible deterrent to aggressive PRC actions. The foundation of American support for Taiwan remains its willingness and ability to deploy credible forces in a timely manner as situations worsen in the western Pacific. Though the United States possesses the world’s most capable force-projection capability, that capability does have limits, especially in East Asia. Carrier battle groups require from three to 16 days to respond to any Pacific crisis; however, their aviation assets possess limited capabilities to sustain combat operations.17 With few nearby airfields, the United States relied heavily on US naval aviation forces to sustain Operation Enduring Freedom. Carrier-based aircraft flew demanding sorties, often seven to 10 hours long, more than 400 nm from their strike group. To execute the long-range, long-duration missions, naval-strike aircraft depended on US Air Force tanker and intelligence, surveillance, and reconnaissance (ISR) assets to act as force multipliers.18 Though US Navy/Marine Corps tactical-aviation assets flew about 75 percent of coalition sorties over Afghanistan, USAF heavy bombers delivered over 70 percent of the coalition’s munitions tonnage.19 Unlike Operations Desert Storm, Noble Anvil, and Iraqi Freedom, where US-led coalition aviation benefited from the presence of numerous airfields in relatively close proximity to the theater of operations, any potential western Pacific conflict will have to be fought at distances more like those flown in Enduring Freedom over Afghanistan. As a matter of perspective, for Enduring Freedom, naval aviation assets often flew sorties into Afghanistan of over 400 nm one way, while refueling tankers based in Qatar flew over 1,100 nm. Based at Diego Garcia, US heavy bombers traveled over 2,900 nm, each way. During Desert Storm and Iraqi Freedom, Kuwait-based coalition forces flew much shorter sorties. Each way, those based near Riyadh traveled about 540 nm and those in Qatar flew around 610 nm. The most effective US naval and air response to a cross-strait threat would combine the Navy’s carrier battle group’s rapid-response and force-projection capability with the Air Force’s ability to dominate and sustain the fight, especially with its force-multiplying C4ISR, aerial-refueling, and strategic-airlift -assets. This joint-force synergy affords the US military the most credible, effective means to penetrate a battlespace close to the PRC’s mainland and prevail. While naval forces possess the inherent ability to deploy anywhere, they operate better when employed with US air forces that need fixed bases to operate. For operations in and around Taiwan, the United States would hope to use its bases on nearby Okinawa (probably Kadena AB, located approximately 350 nm from Taipei) and more distant Guam (probably Andersen AFB, located approximately 1,500 nm from Taipei) (see fig.).

### FOBs key to airspace superiority – provides cover and infrastructure

Air Force Doctrine 99 (Study by the Secretary of the Air Force, “Bases, Infrastructure and Facilities,” 11/13/99. <http://www.fas.org/man/dod-101/usaf/docs/afdd/afdd2-4-4.pdf>)

Aerospace power is only available through the coordination of the total warfare system: the weapon system, the weapon support system, and the basing system. Air Force leaders should recognize the importance and synergy of the basing system in staging, delivering, and sustaining combat power. Aerospace power capabilities depend on cutting-edge delivery systems and their complementary basing systems with an up-to-date, efficient infrastructure. The basing system includes the infrastructure, personnel, materiel, information, and other resources needed to sustain operation of the weapon and weapon support systems. The Air Force generates, flies, fights, and controls its warfighting resources from its bases. The processes, systems, and training of base-level organizations, whether deployed or in garrison, and their ability to enhance the effectiveness of the warfighter’s capabilities is known as the “Blue Order of Battle.” It is here that aerospace power is most dependent and most vulnerable. The base must not only withstand aerial and ground attacks; it must also be capable of supporting concentrated and prolonged air activities against the enemy. Base survival is not enough—the base must be operable and capable of supporting its missions. The following are principles that guide the commander in development of BIF:

### Air power key for Asian deterrence – stops WMD and full-scale war

Tellis et al ’98 (Ashley, Ashley J., Senior Political Scientist at RAND specializing in South Asian Security, Chung Min Lee, James Mulvenon, Courtney Purrington, and Michael D. Swaine, “Sources of Conflict in the 21st Century: Regional Futures and US Strategy,” 1998. <http://www.rand.org/content/dam/rand/pubs/monograph\_reports/MR897/MR897.chap3.pdf>)

REGIONAL CONCLUSIONS AND IMPLICATIONS FOR THE UNITED STATES AIR FORCE This subsection attempts to synthesize some of the key operational implications distilled from the analyses relating to the rise of Asia and the potential for conflict in each of its constituent regions. The first key implication derived from the analysis of trends in Asia suggests that American air and space power will continue to remain critical for conventional and unconventional deterrence in Asia. This argument is justified by the fact that several subregions of the continent still harbor the potential for full-scale conventional war. This potential is most conspicuous on the Korean peninsula and, to a lesser degree, in South Asia, the Persian Gulf, and the South China Sea. In some of these areas, such as Korea and the Persian Gulf, the United States has clear treaty obligations and, therefore, has preplanned the use of air power should contingencies arise. U.S. Air Force assets could also be called upon for operations in some of these other areas. In almost all these cases, U.S. air power would be at the forefront of an American politico-military response because (a) of the vast distances on the Asian continent; (b) the diverse range of operational platforms available to the U.S. Air Force, a capability unmatched by any other country or service; (c) the possible unavailability of naval assets in close proximity, particularly in the context of surprise contingencies; and (d) the heavy payload that can be carried by U.S. Air Force platforms. These platforms can exploit speed, reach, and high operating tempos to sustain continual operations until the political objectives are secured. The entire range of warfighting capability—fighters, bombers, electronic warfare (EW), suppression of enemy air defense (SEAD), combat support platforms such as AWACS and J-STARS, and tankers—are relevant in the Asia-Pacific region, because many of the regional contingencies will involve armed operations against large, fairly modern, conventional forces, most of which are built around large land armies, as is the case in Korea, China-Taiwan, India-Pakistan, and the Persian Gulf. In addition to conventional combat, the demands of unconventional deterrence will increasingly confront the U.S. Air Force in Asia. The Korean peninsula, China, and the Indian subcontinent are already arenas of WMD proliferation. While emergent nuclear capabilities continue to receive the most public attention, chemical and biological warfare threats will progressively become future problems. The delivery systems in the region are increasing in range and diversity. China already targets the continental United States with ballistic missiles. North Korea can threaten northeast Asia with existing Scud-class theater ballistic missiles. India will acquire the capability to produce ICBM-class delivery vehicles, and both China and India will acquire long-range cruise missiles during the time frames examined in this report.

### Air power key for counterterrorism – enables asymmetric warfare

Peck 7 (Major General Allen, USAF, “Airpower’s Crucial Role in Irregular Warfare,” Air and Space Power Journal, March 2007. <http://www.airpower.maxwell.af.mil/airchronicles/apj/apj07/sum07/peck.html>)

Intelligence made available by air and space forces serves as a critical enabler in IW. In traditional warfare, larger yields and/or quantities of weapons can compensate for targeting uncertainties, but this is generally not the case in counterinsurgency operations, in which unintended collateral damage can undermine support for the government and become a recruiting tool for the insurgency. Currently, over both Afghanistan and Iraq, space-based and air-breathing assets alike continuously monitor the situation on the ground, helping identify insurgents as well as their organizational networks, supporters, and lines of communication and supply. These platforms collect and disseminate a variety of intelligence (signals, communications, imagery, moving-target, full-motion-video, etc.), all integral to the fight. Overhead assets also contribute significantly to the emerging field of forensic analysis, which involves backtracking from ongoing events to determine the sources from which they emanated (e.g., tracing back from explosions of IEDs to locate the bomb-making organizations and facilities that support them). In both Iraq and Afghanistan, airborne assets have developed the capacity to respond quickly to determine the launch points of mortar or rocket attacks, identify suspicious individuals/vehicles and mark them with laser designators for apprehension by ground forces, or, in many cases, destroy them outright. As with other airpower applications, centralized control of intelligence platforms (which minimizes duplication of effort and ensures support for the joint force commander’s highest-priority requirements) enables effective and efficient use of limited ISR assets—key elements of the coalition’s asymmetric advantage in IW. For example, effective ISR enables the air component to bring airpower to bear in support of small coalition or indigenous ground-force units, magnifying their organic capabilities. Precision strike, another highly effective tool of counterinsurgency, permits us to eliminate insurgents in close proximity to civilians or friendly ground forces, thus giving coalition forces a significant firepower advantage. Highly accurate guidance systems, cockpit-­selectable fuzes, and munitions of various explosive yields allow Airmen to deliver intended effects precisely while limiting unintended effects. Of course, in certain situations we may need to attack large areas with less discriminate use of firepower—a task for which airpower is also well suited. Air mobility offers another edge in counter­insurgent operations. Our forces exercise this advantage over surface-bound IW adversaries by transporting personnel and cargo while bypassing contested lines of communications, air-dropping supplies, and quickly evacuating the wounded. In Iraqi Freedom and Enduring Freedom last year, the air component flew over 50,000 airlift sorties, transporting over 1,000,000 personnel and 90,000 pallets of cargo that otherwise would have moved via slower, more vulnerable ground-based means of transportation. The mobility advantage also enables the infiltration, resupply, and exfiltration of relatively small ground units. By providing humanitarian assistance, medical support, and transportation for government officials to remote areas, airpower can promote the government’s credibility and improve the quality of life for its population. These types of operations, which directly affect and are immediately visible to the population in question, can have significant effects in the overall campaign against the insurgents. Coupled with relatively small numbers of coalition and indigenous forces, airpower can bring a full spectrum of effects to bear, from humanitarian to electronic to kinetic. In some cases, the mere visible or audible presence of airpower can demonstrate commitment to a population and support to a government as well as shape the behavior of insurgents by reducing their freedom of movement and denying them sanctuaries.

## Fwd Deployments key to heg

### Only forward deployed troops can ensure credibility—necessary trip wire to ensure commitment

Davis et al 9 (Jacquelyn, Ex. VP – Institute for Foreign Policy Analysis, Robert L. Pfaltzgraff, Pres. – IFPA and Prof. Int’l. Sec. Studies – Fletcher School of Law and Diplomacy of Tufts U. and former DOD Consultant, Charles M. Perry , VP and Dir. Studies – IFPA, and James L. Schoff, Associate Dir. Asia-Pacific Studies – IFPA, Institute for Foreign Policy Analysis White Paper, “Updating U.S. Deterrence Concepts and Operational Planning: Reassuring Allies, Deterring Legacy Threats, and Dissuading Nuclear "Wannabes"”, February, http://www.ifpa.org/pdf/Updating\_US\_Deterrence\_Concepts.pdf, p. 7-8)

No such formula was put into place in Asia, which in any case lacked a multilateral framework comparable to that of NATO. Instead, for Japan and South Korea, the U.S. extended deterrence guarantee was explicitly tied to the bilateral U.S. security relationships that were developed with each country and were made manifest in the forward deployment of American forces.As in NATO**,** these were regarded by their host governments as “trip-wire forces” necessary to ensure the steadfast nature of the U.S. commitment to come to their defense in a crisis, even one where nuclear escalation was possible.5 In South Korea, the United States deployed as it still does a sizable contingent of U.S. Army and Air Force troops to deter a renewed North Korean attack and to signal U.S. resolve to escalate to whatever level might be necessary to repel such an at- tack, thereby underscoring America’s extended deterrent commitment to the Republic of Korea (ROK). In Japan, the United States Navy has home-ported one of its aircraft carriers at Yokosuka, while the Marines deployed forces on Okinawa, the Army at Camp Zama, and the Air Force at bases near Tokyo and Misawa, to reinforce the notion of extended deterrence. That said, the extended deterrence concept has not always seemed convincing to U.S. allies, and, were it not for the forward deployment of American troops, the willingness of the United States to put itself at risk to protect Allied interests would probably have been more widely questioned than it has been to date. Nonetheless, despite the fact that some U.S. allies, such as France and Israel, chose to go down the nuclear path themselves, most NATO nations, Japan, and even the ROK, despite putting into place the capacity for exercising a nuclear option should political and/or strategic circumstances change, have been satisfied that they shared with the United States a common threat perception and trusted that the United States would come to their defense if necessary**.**

## Now key time

### Shifting away from Petroleum is NOW key to US heg-Readiness and Innovation

**Parthemore & Nagl 10** (Christine Parthemore, Fellow at the Center for New American Security, John Nagl, President of the Center for New American Security, “Fueling the Future Force: Preparing the Department of Defense for a Post-Petroleum Era”, http://www.cnas.org/node/5023, September 2010) SV

Now is an opportune time to make this transition. As the services redeploy from current wars, the Army (and to a lesser extent the other services) have years of reset ahead of them. Acquisition reforms and personnel restructuring initiatives launched by Secretary Robert Gates in 2009 and 2010 will continue through the Obama administration and likely beyond. Together, these developments will present opportunities to procure new, more energy-efficient systems. A successful transition away from petroleum will produce financial, operational and strategic gains. Reducing dependence on petroleum will help ensure the long-term ability of the military to carry out its assigned missions — and help ensure the security of the nation. Though adopting nonpetroleum fuels will require an initial investment, it will likely be recouped in **budget savings** over the long term. Finally, moving beyond petroleum will allow DOD to lead in the development of innovative technologies that can benefit the nation more broadly, while **signaling to the world that the United States has as innovative and adaptable force**.

### Now is key – fuel prices will tank military posture

Wald et al 9 (General Charles F Wald, Former Deputy Commander, Headquarters U.S. European Command, General Gordon R. Sullivan, Former Chief of Staff, U.S. Army, and Former Chairman of the CNA MAB, Vice Admiral Richard H. Truly, Former NASA Administrator, Shuttle Astronaut and the ﬁrst Commander of the Naval Space Command, “Powering America’s Defense,” May 2009. <http://www.cna.org/sites/default/files/Powering%20Americas%20Defense.pdf>)

While the current ﬁnancial crisis provides enormous pressure to delay addressing these critical energy challenges, the MAB warns against delay. The economic risks of this energy posture are also security risks. The U.S. consumes 25 percent of the world’s oil production, yet controls less than 3 percent of an increasingly tight supply. Oil is traded on a world market, and the lack of excess global production makes that market volatile and vulnerable to manipulation by those who control the largest shares. Reliance on fossil fuels, and the impact it has on other economic instruments, affects our national security, largely because nations with strong economies tend to have the upper hand in foreign policy and global leadership. As economic cycles ebb and ﬂow, the volatile cycle of fuel prices will become sharper and shorter, and without immediate action to address our nation’s long-term energy proﬁle, the national security risks associated with the nation’s and the military’s current energy posture will worsen.

### Must act to address dependence now.

**Parthemore & Nagl 10** (Christine Parthemore, Fellow at the Center for New American Security, John Nagl, President of the Center for New American Security, “Fueling the Future Force: Preparing the Department of Defense for a Post-Petroleum Era”, http://www.cnas.org/node/5023, September 2010) SV

The Center for a New American Security (CNAS) launched a project in September 2009 to examine DOD’s energy challenges and recommend a path forward. We convened DOD leaders and nongovernmental experts; researched current laws, requirements and projects; and visited military bases around the country to discuss DOD’s energy challenges and opportunities. From this research, we concluded that DOD needs a long-term strategy to adopt alternative fuels based on our reading of current trends in petroleum availability and use, as well as our identification of petroleum dependence as a long-term vulnerability for DOD. DOD officials increasingly understand this vulnerability. During the course of our project, the Navy appointed two-star officers to lead two task forces on energy and climate change. Their activities, which began quietly within the bureaucracy, are now well-known examples of leadership by the U.S. armed forces. The Air Force and Navy flight-tested camelina-based biofuel blends in the past year.3 The Air Force’s Air Mobility Command and the Office of the Secretary of Defense (OSD) are working to increase energy efficiency and maximize fuel savings in existing platforms and new acquisitions. The Quadrennial Defense Review (QDR) presented instructions for integrating energy considerations into how DOD does business. Bases around the country are investing in solar, wind and geothermal projects. DOD is working to comply with federal energy mandates, and in particular those found in the Energy Independence and Security Act (EISA) of 2007, President Barack Obama’s October 2009 Executive Order on resource conservation by federal agencies and defense authorization acts. Though each of the services has admirably developed its own energy strategy to improve its near-term energy management, DOD must also develop a comprehensive long-term energy strategy. The strategies developed by individual services focus heavily on electricity usage at domestic installations, which accounts for a relatively small fraction of DOD’s energy needs, and most goals within these strategies do not look beyond 2015 or 2020 – a timeline that is too short to ensure DOD’s long-term energy security. Moreover, there is no single official who oversees DOD’s entire energy portfolio; authority within DOD is currently divided, which is likely to complicate implementation of the strategy. This report lays out the strategic necessity for DOD to find alternatives to petroleum over the next 30 years and then presents important steps in achieving that long-term goal.

## \*\*\*Budget Extensions\*\*\*

## FF kill the budget

### **No DoD green tech – promising efforts just fall short**

PES Europe 8 (Think tank, “Solar: the military’s secret weapon,” 2008. http://www.pes.eu.com/assets/misc/issue-9-think-tank-military-solarpdf-33.pdf)

The army has been making many bold declarations in recent years about the need to wean itself from fossil fuels. It is “imperative” that the Department of Defense “apply new energy technologies that address alternative supply sources and efﬁcient consumption across all aspects of military operations,” concluded one Pentagon report. “Effectively immediately,” thunder another, Pentagon planners must factor in “energy efﬁciency” when designing “all tactical systems.” That’s because the Defense Department is not only one of the world’s largest consumers of oil and gas — guzzling “110 million barrels of premium fuel and 3.8 billion kilowatts of electricity at a cost of $13.6 billion.” It is also ridiculously expensive: war-zone fuel prices can reach up to $400 per gallon. The military’s record of answering those green clarion calls has been uneven, however. For every promising, isolated effort — wind-powered bases, waste generators in Baghdad — they have been disappointments, too. Long-promised hybrid Humvees [four wheel drive trucks] never materialised and “urgent” pleas from battleﬁeld commanders for green power stations were nixed by the Pentagon.

### Solving energy solves the greatest part of the budget

Beach 9 (Dr. Fred C, Post-Doc Fellow at the Center for International Energy and Environmental Policy at UT Austion, Naval Officer, Naval Aviator, Surface Warfare Officer, “DoD’s Addiction to Oil: Is there a Cure?,” March 15 2011. <http://www.ensec.org/index.php?view=article&catid=114%3Acontent0211&id=281%3Adods-addiction-to-oil-is-there-a-cure&tmpl=component&print=1&page=&option=com\_content&Itemid=374>)

When it comes to reducing a budget, whether it is a fiscal budget or an energy budget, the biggest gains to be had are in the largest budget categories, and for DoD that means the operational energy budget. Over 70% of the energy consumed by DoD goes towards operations. This includes energy for aircraft, ships, tactical vehicles, and expeditionary bases used in training, deploying, and sustaining our armed forces around the world. Since operational forces are mobile by nature, they demand fuels with the highest possible energy density and transportability, namely petroleum based fuels. For moving large quantities of people and material around the world, the most “energy efficient” means is by ship and the least is by air. Conversely, the most “time efficient” means is just the opposite. As America and the rest of the industrialized world has become addicted to “just in time” and “overnight” delivery of every imaginable commodity, so has DoD.

### **Oil dependency forces tradeoff – huge fuel costs cripple funding for other programs**

Wald et al 9 (General Charles F Wald, Former Deputy Commander, Headquarters U.S. European Command, General Gordon R. Sullivan, Former Chief of Staff, U.S. Army, and Former Chairman of the CNA MAB, Vice Admiral Richard H. Truly, Former NASA Administrator, Shuttle Astronaut and the ﬁrst Commander of the Naval Space Command, “Powering America’s Defense,” May 2009. <http://www.cna.org/sites/default/files/Powering%20Americas%20Defense.pdf>)

In addition to burdening our military forces, overreliance on oil exacts a huge monetary cost, both for our economy and our military. The ﬂuctuating and volatile cost of oil greatly complicates the budgeting process within the Department: just a $10 change in the per-barrel cost of oil translates to a $1.3 billion change to the Pentagon’s energy costs [45]. Over-allocating funds to cover energy costs comes with a high opportunity cost as other important functions are under-funded; an unexpected increase results in funds being transferred from other areas within the Department, causing signiﬁcant disruptions to training, procurement and other essential functions. In addition to buying the fuel, the U.S devotes enormous resources to ensure the military receives the fuel it needs to operate. A large component of the logistics planning and resources are devoted to buying, operating, training, and maintaining logistics assets for delivering fuel to the battleﬁeld—and these delivery costs exceed the cost of buying the commodity. For example, each gallon of fuel delivered to an aircraft in-ﬂight costs the Air Force roughly $42 [35]; for ground forces, the true cost of delivering fuel to the battleﬁeld, while very scenario dependent, ranges from $15 per gallon to hundreds of dollars per gallon [35]. A more realistic assessment of what is called the “fully burdened price of fuel” would consider the costs attributable to oil in protecting sea lanes, operating certain military bases and maintaining high levels of forward presence. Buying oil is expensive, but the cost of using it in the battlespace is far higher.

### The DOD budget is zero sum-Increasing oil prices are wreaking havoc on other programs

**Morehouse et al 8** (Thomas Morehouse, Chairman of the DOD Task Force, “Report of the Defense Science Board Task Force on DoD Energy Strategy”, http://www.acq.osd.mil/dsb/reports/ADA477619.pdf, February 2008) SV

Recently, tight supplies and strong demand have characterized the oil market, putting upwards pressure on prices. Fiscal Year (FY) 07 is the first year the DESC has changed its standard price in mid-year. This price is used by government customers to budget for fuel purchases. In real terms, world oil prices are currently near historic highs, approaching those of the oil crisis of the early 1980s. From 2004 to 2006, DESC fuel sales more than doubled from $5.9 B to $13.6 B., most of the increase being due to rising prices for petroleum products. Such rapid increases in the commodity cost of fuel get leadership attention because of their effect on budgets. DoD operates on a six year Future Year Defense Plan (FYDP) funding horizon. **Increases of this magnitude mean that large sums of money must be re-programmed in order to meet operating costs, wreaking havoc on programs from which the funds are taken.**

## Budget key to heg

### Lack of funding creates a hollow force – prevents modernization and basic training, crippling military security

**Carafano, Eaglen & Spring 7** (James Jay - Deputy Director, The Kathryn and Shelby Cullom Davis Institute for International Studies and Director, Douglas and Sarah Allison Center for Foreign Policy Studies, Mackenzie - Research Fellow for National Security Studies, Allison Center for Foreign Policy Studies, and Baker - F.M. Kirby Research Fellow in National Security Policy, “Four Percent for Freedom: Maintaining Robust National Security Spending,” 4/10/07. <http://www.heritage.org/research/reports/2007/04/four-percent-for-freedom-maintaining-robust-national-security-spending>)

Despite intense military activity since 9/11, defense spending is at a historical low and has been for too long. Current and future Administrations and Congress should commit now to spending 4 percent of gross domestic product (GDP) on national defense even after any drawdown of U.S. forces in Afghanistan or Iraq, both to pre­vent a recurrence of the "hollow force" and to meet the military's immediate modernization needs. Although defense spending has been relatively restrained, expen­ditures on Social Security, Medicare, and Medicaid have been exploding. Meeting the resource needs for winning the war on terrorism includes maintain­ing overall defense budgets at 4 percent of GDP while simultaneously recognizing that projected growth in entitlement expenditures will jeopardize the nation's ability to wage war over the long term. This harsh fact makes entitlement reform a national security issue. Avoiding a "Hollow Force." The term "hollow force" was coined in the post-Vietnam War era to describe a military force that lacks the resources to field trained and ready forces, to support ongoing operations, and to modernize. In the past, when America's military has begun to become hollow, the strain has showed first in the National Guard. The same warning signs are evident today, including an austere lack of equipment, heavy reliance on cross-leveling to fill out units preparing to deploy, and a reduction in the levels of unit readiness. However, this problem is not exclusive to the National Guard. The Army and Air Force are already showing signs of funding shortfalls for equipment modern­ization. Although today's military is not yet hollow, it could become so in less than a decade if funding for military modernization is not adequate over a sustained period of time. Moreover, underfunding defense will actually cost the U.S. more in the long run, including reduc­ing the defense industrial base to a dangerously low level. This leads to an undercapitalized base that is not competitive, driving up costs for the U.S. gov­ernment and taxpayer. Not spending enough on defense also creates the reality and perception of American weakness, which will increase risk, hinder economic growth, and lower stability in the world. Indeed, robust defense spending saves money. President Ronald Reagan's defense buildup and steady defense funding throughout the 1980s helped to win the Cold War and enabled the U.S. to quickly defeat Saddam Hussein in the Gulf War. Regrettably, the Administration's defense budget request and emergency supplemental spending bill come at a time when political pressure to reduce defense expenditures is growing. The perception is that the battle in Iraq constitutes the entirety of the war effort and that as this operation winds down, the American people are entitled to a new peace div­idend. This notion, coupled with the imminent retirement of 78 million baby boomers, means that the danger of a hollow force is very real. Mandatory spending in the U.S. budget is projected to increase significantly in the coming years. The Congressional Budget Office projects that the share of the U.S. economy devoted to defense spending will actually decrease as a result. Entitlement Reform as National Security Issue. The U.S. government is running a large bud­get deficit, and the principal reason is the growth in entitlement costs, not increased defense funding since 9/11. Since 1970, the historical ratio between defense spending and entitlement spending on Medicare, Medicaid, and Social Security has flipped. In 1970, military spending totaled 7.8 percent of GDP-almost twice the 4.1 percent of GDP spent on the big three entitlement programs. Today, defense spending has fallen to 3.9 percent of GDP while enti­tlement spending has more than doubled to 8.8 per­cent of GDP. By 2030, the big three entitlements will absorb roughly 84 percent of all federal revenues, crowding out defense and homeland security and threatening the historically low-tax, high-growth U.S. economy. Congress needs to find a solution to the entitlement spending problem quickly. Consequently, defense is not the problem with the budget, and cutting defense is not the solution. As a nation at war, the U.S. is spending remarkably little on defense. Devoting 4 percent of GDP to defense imposes a reasonable burden on the U.S. economy and is significantly below the mean of roughly 7.5 percent of GDP that the U.S. spent on defense during the Cold War. Spending 4 percent of GDP will not risk losing the war because of economic collapse brought on by excessive defense spending. Further, Congress needs to keep in mind the economic costs of mili­tary failure. Military power trumps economic power in the short term. Even a single successful attack on U.S. territory using an electromagnetic pulse gener­ated by a nuclear weapon would have devastating economic consequences. What the U.S. Should Do. Over the long term, federal spending should be reformed to provide ade­quate funds for current defense needs, and the shape of the U.S. military should continue to transform to reflect future threats. Rather than decrease defense spending, Congress needs to make a strong commit­ment to fund the nation's war requirements well into the future; indeed, the next President and future Congresses must also commit to providing for the nation's defense through increased defense budgets. Both Congress and the President should also begin the difficult task of changing public opinion, not fol­lowing it, by reminding the American people that the ongoing war is not over, regardless of what hap­pens in Iraq, and that the stakes in this war extend to their lives, liberty, and future prosperity. Conclusion. Spending 4 percent of GDP on national defense will allow the U.S. to keep the nation and its service members properly trained, equipped, and ready. In the long term, continuing to underfund defense and then allowing wild fluctuations in defense budgets during times of war will only cost the country more and compromise national security. Congress and the Administration should commit now to spending at least 4 percent of GDP on national security, and they should move swiftly to reform the major entitlement programs that threaten both the budget and the economy over the long term.

### Bad budget prevents conflict resolution – Europe, Pakistan and Iran

Kagan 9 (Robert, a senior associate at the Carnegie Endowment for International Peace, “No Time to Be Cutting the Defense Budget,” 2/3/09. http://www.washingtonpost.com/wp-dyn/content/article/2009/02/02/AR2009020202618.html)

A reduction in defense spending this year would unnerve American allies and undercut efforts to gain greater cooperation. There is already a sense around the world, fed by irresponsible pundits here at home, that the United States is in terminal decline. Many fear that the economic crisis will cause the United States to pull back from overseas commitments. The announcement of a defense cutback would be taken by the world as evidence that the American retreat has begun. This would make it harder to press allies to do more. The Obama administration rightly plans to encourage European allies to increase defense capabilities so they can more equitably share the burden of global commitments. This will be a tough sell if the United States is cutting its own defense budget. In Afghanistan, there are already concerns that the United States may be "short of breath." In Pakistan, the military may be tempted to wait out what its members perceive as America's flagging commitment to the region. A reduction in defense funding would feed these perceptions and make it harder for Obama's newly appointed special envoy, Richard Holbrooke, to press for necessary changes in both countries. What worries allies cheers and emboldens potential adversaries. The Obama administration is right to reach out and begin direct talks with leaders in Tehran. But the already-slim chances of success will grow slimmer if Iranian leaders believe that the United States may soon begin pulling back from their part of the world. President Mahmoud Ahmadinejad's spokesman has already declared that the United States has lost its power -- just because President Obama said he is willing to talk. Imagine how that perception would be reinforced if Obama starts cutting funding for an already inadequately funded force.

### Budget capacity cuts collapse deterrence and cause global wars

Kagan 11 (Senior Fellow in Foreign Policy at the Brookings Institution, “The Price of Power: The benefits of U.S. defense spending far outweigh the costs,” *Weekly Standard* Vol. 16 No. 18, 1/24/11. <http://www.weeklystandard.com/articles/price-power\_533696.html?page=1>)

American forces deployed in East Asia and the Western Pacific have for decades prevented the outbreak of major war, provided stability, and kept open international trading routes, making possible an unprecedented era of growth and prosperity for Asians and Americans alike. Now the United States faces a new challenge and potential threat from a rising China which seeks eventually to push the U.S. military’s area of operations back to Hawaii and exercise hegemony over the world’s most rapidly growing economies. Meanwhile, a nuclear-armed North Korea threatens war with South Korea and fires ballistic missiles over Japan that will someday be capable of reaching the west coast of the United States. Democratic nations in the region, worried that the United States may be losing influence, turn to Washington for reassurance that the U.S. security guarantee remains firm. If the United States cannot provide that assurance because it is cutting back its military capabilities, they will have to choose between accepting Chinese dominance and striking out on their own, possibly by building nuclear weapons. • In the Middle East, Iran seeks to build its own nuclear arsenal, supports armed radical Islamic groups in Lebanon and Palestine, and has linked up with anti-American dictatorships in the Western Hemisphere. The prospects of new instability in the region grow every day as a decrepit regime in Egypt clings to power, crushes all moderate opposition, and drives the Muslim Brotherhood into the streets. A nuclear-armed Pakistan seems to be ever on the brink of collapse into anarchy and radicalism. Turkey, once an ally, now seems bent on an increasingly anti-American Islamist course. The prospect of war between Hezbollah and Israel grows, and with it the possibility of war between Israel and Syria and possibly Iran. There, too, nations in the region increasingly look to Washington for reassurance, and if they decide the United States cannot be relied upon they will have to decide whether to succumb to Iranian influence or build their own nuclear weapons to resist it. In the 1990s, after the Soviet Union had collapsed and the biggest problem in the world seemed to be ethnic conflict in the Balkans, it was at least plausible to talk about cutting back on American military capabilities. In the present, increasingly dangerous international environment, in which terrorism and great power rivalry vie as the greatest threat to American security and interests, cutting military capacities is simply reckless. Would we increase the risk of strategic failure in an already risky world, despite the near irrelevance of the defense budget to American fiscal health, just so we could tell American voters that their military had suffered its “fair share” of the pain?

## SBSP solves Budget

### Fuel costs hamstring the DOD- SBSP solves.

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

The SBSP Study Group found that the U.S. Department of Defense (DoD) has a large, urgent and critical need for secure, reliable, and mobile energy delivery to the war‐fighter. When all indirect and support costs are included, it is estimated that the DoD currently spends over $1 per kilowatt hour for electrical power delivered to troops in forward military bases in war regions. OSD(PA&E) has computed that at a wholesale price of $2.30 a gallon, the fully burdened average price of fuel for the Army exceeds $5 a gallon. For Operation IRAQI FREEDOM the estimated delivered price of fuel in certain areas may approach $20 a gallon. Significant numbers of American servicemen and women are injured or killed as a result of attacks on supply convoys in Iraq. Petroleum products account for approximately 70% of delivered tonnage to U.S. forces in Iraq—total daily consumption is approximately 1.6 million gallons. Any estimated cost of battlefield energy (fuel and electricity) does not include the cost in lives of American men and women. The DoD is a potential anchor tenant customer of space‐based solar power that can be reliably delivered to U.S. troops located in forward bases in hostile territory in amounts of 5‐50 megawatts continuous at an estimated price of $1 per kilowatt hour, but this price may increase over time as world energy resources become more scarce or environmental concerns about increased carbon emissions from combusting fossil fuels increases.

### SBSP massively reduces costs – eliminates energy transportation costs

Fan et al 11 (William, Harold Martin, James Wu, Brian Mok – researchers at Caltech, “Space Based Solar Power – Industry and Technology Assessment,” 6/2/11. <http://www.pickar.caltech.edu/e103/Final%20Exams/Space%20Based%20Solar%20Power.pdf>)

While this is a niche market, it is by no means insignificant. The military is already spending significant amounts to secure energy for its bases, resulting in high cost, exposure to world fuel prices as well as substantial loss of life in vulnerable fuel transportation convoys. Consider Afghanistan, where the Pentagon estimates that fuel for base generators has a fully loaded average cost of $400 per gallon. In a typical FOB generator configuration, the base outputs approximately 52897 kWh per day using 4880 gallons of fuel. Thus, the cost of electricity is approximately 36.90 dollars per kWh. This represents a 3700% premium over the average US household cost of 0.10 dollars. Therefore, a military ready SBSP system could be deployed in short order and still result in significant savings to the military. A scenario to accomplish this could be the deployment of a folding rectenna on a single military truck. Once in place, there would be no ongoing supply chain risk. In addition to cost savings, a SBSP system would result in saved lives and more effective allocation of military personnel and resources. A major difficulty presented by this scenario, however, is that the rectenna would have to be well secured while simultaneously ensuring that energy from the satellite does not have destructive effects on the surrounding area (i.e. the rest of the base) or the base’s communications systems.

### Reducing dependence bolsters the budget and improves security

Nagl and Parthemore in 10 (John, president of the Center for New American Security, and Christine, fellow at the Center for New American Security, “Fueling the Future Force,” *Center for the New American Security*, September 2010. <http://www.cnas.org/files/documents/publications/CNAS\_Fueling%20the%20Future%20Force\_NaglParthemore.pdf>)

A successful transition away from petroleum will produce financial, operational and strategic gains. Reducing dependence on petroleum will help ensure the long-term ability of the military to carry out its assigned missions — and help ensure the security of the nation. Though adopting nonpetroleum fuels will require an initial investment, it will likely be recouped in budget savings over the long term. Finally, moving beyond petroleum will allow DOD to lead in the development of innovative technologies that can benefit the nation more broadly, while signaling to the world that the United States has as innovative and adaptable force. This transition should not compromise readiness and, indeed, DOD must always put mission first. However, DOD need not choose between accomplishing its mission and minimizing the strategic risks, price fluctuations and negative environmental effects of petroleum consumption. By providing the private sector with stable market signals and incentives to invest in scaling up the fuels that meet its unique energy needs, DOD will never need to sacrifice performance or national security for energy security. Rather, reducing reliance on petroleum will only help the armed services to accomplish their missions in the years and decades to come.

## Perception

### Larger budgets improve credibility and military leadership

Carafano 8 (James Jay - Deputy Director, The Kathryn and Shelby Cullom Davis Institute for International Studies and Director, Douglas and Sarah Allison Center for Foreign Policy Studies, “Prepping the military for defeat,” The Virginian-Pilot, 8/27/08. <http://findarticles.com/p/news-articles/virginian-pilot-ledger-star-norfolk/mi\_8014/is\_20080827/prepping-military-defeat-prepping-military/ai\_n41414642/> )

AFTER the Vietnam War, respect for the military sank to an all- time low. In one survey, sanitation workers were the only profession Americans thought less of - and some considered that an insult to sanitation workers. Defense spending plummeted. The armed services "hollowed out," lacking the budgets to sustain modernization, training and readiness. By the end of the 1980s, however, after the Reagan-era military build-up, the military polled as the most admired institution in the nation. Even today, despite the political debates over the Long War on Terrorism, the armed forces remain highly respected. For that reason, many Pentagon experts believe that after Iraq and Afghanistan, Congress and the White House won't abandon the military they way they did before. They won't put readiness at risk again, right? Wrong. There are already plenty of troubling signs. The Navy is talking about tying up ships because they don't have enough sailors. The Army has artillery and engineer battalions that haven't practiced firing cannons or breaching a minefield in a long time. The Air Force might well have just lost its service secretary and chief of staff, not because of their alleged failure to exercise leadership but because they chaffed at accepting unrealistic budget projections. Washington officials probably will use the same excuses they did after Vietnam to justify reneging on their obligation to "provide for the common defense." They will argue that they can spend less on defense because they're so smart. They know exactly what the future holds, what the threats will be, how to handle them - and, miraculously, the cost of this defense will be exactly the paltry amount of money they're willing to spend. Such "smart spending" was what the Pentagon offered after Vietnam. Rather than rebuild the military and match the Soviets' conventional power, President Carter's Pentagon opted for an "offset" strategy. They would replace boots on the ground with smart weapons to offset Soviet numbers. This would be more effective - and coincidently cheaper. As Yale scholar Paul Bracken put it, "They got away with it because President Carter didn't want to buy anything. He was very interested in innovation as long as it didn't require purchasing military equipment." Some old Carter hands even have the temerity to argue the offset strategy helped win the Cold War. Nothing could be further from the truth. Many of the technologies they promoted never matured, or were fully deployed only after the Cold War ended. Indeed, Council on Foreign Relations defense analyst Stephen Biddle cogently argues much of the success of rebuilding of U.S. conventional forces had to do with the robust training and doctrine instituted in the 1980s, part of the Reagan-era effort along with growing the forces and buying new equipment that resulted in the war-winning Desert Storm military. There are already signs, however, that the old Carter arguments are coming back. Very smart people will argue that Washington can gut budgets, ignore the need to buy next generation platforms and short-change training and maintenance because they know exactly what to cut. Of course, first they will cut the things they don't want - politically incorrect systems such as missile defense, space-based weapons and modernized nuclear forces. Then they will wish away the wars they don't want to prepare for - insurgencies and conventional conflicts with regional powers. Finally, they will assume that America's enemies will be blinded by their brilliance and not prepare for exactly the kinds of wars Washington does not fund the military to fight. They will wind up preparing the military for defeat. The one initiative brilliant budget-cutters will not undertake is to provide robust, sustained funding of the armed services that will pay for current operations; maintain a trained and ready military for a range of missions; and modernize forces for the future. But that's exactly what needs to be done to keep the nation safe, free and prosperous in the 21st century.

## Funding Tradeoff

### New funding key for modernization and new tech

Bennett 11 (John T, editor for the Federal Times, “Defense Industry dodges bullet, but more cuts could be coming,” Federal Times, 1/14/11. http://www.federaltimes.com/article/20110114/DEPARTMENTS01/101140301/)

The secretary told reporters the White House reduction proves the days of "endless money" flowing into Pentagon weapon programs are long gone. If DoD wants more money for procurement and development, it will have to squeeze it from elsewhere in its budget, he said. "There won't be any more money for these programs coming in from outside," he said. And if some lawmakers have their way, the defense budget might actually shrink. After Gates' announcement, some Democrats instantly called for bigger cuts. House GOP leaders recently said defense cuts will be on the table as part of deficit-reduction efforts. And many new lawmakers of the tea-party ilk have yet to clearly state their positions on things like Pentagon spending. Cord Sterling, vice president of the Aerospace Industries Association, said industry supports Gates' efficiencies drive but is "very concerned with any proposals to cut or eliminate programs that would increase costs in the future," adding such moves could "negatively impact the U.S. industrial base and impair" combat capability. House Armed Services Committee Chairman Rep. Howard "Buck" McKeon, R-Calif., and other congressional advocates of bigger budgets will have their say on the EFV termination and Gates' plan to push the STOVL F-35 variant to the back of the production schedule. McKeon has already signaled his disapproval of Gates' decisions. "These cuts are being made without any commitment to restore modest future growth, which is the only way to prevent deep reductions in force structure that will leave our military less capable and less ready to fight," McKeon said in a statement. "This is a dramatic shift for a nation at war and a dangerous signal from the commander in chief." Mackenzie Eaglen, a former Senate defense staffer and now a Heritage Foundation analyst, said the $78 billion cut will leave the military challenged in future fights. "Yes, the military is buying a handful of next-generation systems, but those plans are constantly being scaled back because of ongoing spending cuts," Eaglen said. "Simply recapitalizing legacy systems will not be enough in five to 10 years, particularly if the military remains engaged around the world as it's likely to do."

### Only new funding solves Air Force readiness – the force is out of emergency funds

Brannen, Cavas and Majumdar 11 (Kate, Christopher and Dave, staff writers for the Federal Times, “2011 Budget delay causes issues for Defense Department,” Federal Times, 2/6/11. <http://www.federaltimes.com/article/20110206/DEPARTMENTS01/102060304/>)

The delays and uncertainty are causing all sorts of problems throughout the military services. For example, Air Force leaders worry they will run out of money to pay troops. The Air Force's military personnel budget is $1.2 billion short, and the operations and maintenance budget is facing a $4.6 billion deficit. "If we don't get some degree of relief, as the Congress continues its work, those will impose significant real implications on Air Force operations," said Jamie Morin, assistant Air Force secretary for financial management. Morin said the service is operating under a $7 billion shortfall compared with the White House budget request. The service also is hamstrung when it comes to awarding new contracts, increasing production rates for needed equipment, or funding military construction projects, he said. A bow wave of deferred aircraft maintenance, facility maintenance and military health care costs is building up as the service operates under constraints of the continuing resolution. Air Force Vice Chief Gen. Philip Breedlove said in a Feb. 3 e-mail that the CR "has negatively affected Air Force modernization programs. Production rate increases and new production — which includes military construction — have been prohibited." He added that day-to-day operations are constrained. "Funding shortfalls in military pay and health care will affect training and readiness," he said. The Air Force has responded by shifting around what funds it can under the law, but the service is running out of room to maneuver. "Our ability to mitigate is basically fully used up now," Morin said. The service had been raiding procurement accounts to stave off a breakdown, but those funds are running dry, said Maj. Gen. Alfred Flowers, the Air Force's deputy assistant secretary for budget. The result is that deployed troops are not getting the equipment they need, Morin said. Morin said one example was the MQ-9 Reaper unmanned aircraft. Under the proposed 2011 budget, the Air Force was planning to purchase 48 Reapers this year as it attempts to increase the number of combat air patrols in Afghanistan to 65 orbits. However, Morin said, the Air Force is prohibited from buying more than 24 aircraft because of the budget impasse. "Which means we're going to delay getting capability to Afghanistan," he said. Another program affected is the F-15E active electronically scanned array radar upgrade, Morin said. If the contract for the upgrade is not awarded this year, the service may have to ground the aircraft "down the road" as spare parts are no longer available for their current radar sets. If a budget is not passed at all this year, the impact will also be felt by the F-15C fleet, which is also receiving new radar. Flowers said other affected programs include GPS satellites, the Joint Air-to-Surface Standoff Missile, Joint Strike Fighter, new tanker and the Wideband Global SATCOM system, among others.

### Freeing up funding key for base operations and Navy readiness

Brannen, Cavas and Majumdar 11 (Kate, Christopher and Dave, staff writers for the Federal Times, “2011 Budget delay causes issues for Defense Department,” Federal Times, 2/6/11. <http://www.federaltimes.com/article/20110206/DEPARTMENTS01/102060304/>)

The cash crunch will be particularly challenging for personnel, shipbuilding and other procurement accounts: • Yearlong support and maintenance contracts for base operations can't be signed. "Hundreds of contracts have been broken into short installments," the senior Navy official said; • Personnel travel has been cut by 25 percent; • Hiring freezes have been put in place in the Marine Corps and Navy; • Security clearance investigations have been curtailed; and • Permanent-change-of-station (PCS) orders are being slowed. Other effects of prolonging the CR, the Navy source said, would be: • Cancellation of 29 surface ship overhauls; • Deferred maintenance on aircraft, aircraft engines and equipment; • Deferred certification of weapons; • Cutbacks in training and exercises, ship and aircraft operations, and combat support and combat service support. Navy budget director Rear Adm. Joe Mulloy said that dealing with a few months of the CR can be managed, but problems grow as the second quarter of the fiscal year begins in January. "We can hold our breath," Mulloy said Feb. 3. "Typically, a lot of contracts are not designed to be let in the first quarter of the fiscal year. But when we go into the second quarter and there's still the potential of a yearlong CR — which has never happened to the entire Department of Defense — you reach a point where you're limited by dollars and by quantity. "And the dollars become extremely difficult in the operations and maintenance world, and in the manpower costs," Mulloy added. The shipbuilding accounts could be especially hard hit if the CR is extended. "I'm about $6 billion out of whack in ship construction," Mulloy said. For 2011, the service wants to spend money on a new aircraft carrier, a second Virginia-class submarine, a new destroyer and the upcoming refueling overhaul of the aircraft carrier Abraham Lincoln. About $1.7 billion is available for a new amphibious ship — the Navy received that much for a 2010 ship — but the service doesn't need one in 2011. But without the specific authority to move money between ship accounts, the Navy's hands are tied. "I have dollars in the wrong place," Mulloy said. This was to have been the first year since 1989 that the Navy hoped to order two submarines. A contract to start work on one of the subs was awarded in January to General Dynamics, but no money is available for the second sub. GD agreed, however, to hold the price for the second ship until March 21 so, should the money come by then, the Navy can still take advantage of the price benefits of ordering two at a time. But the impacts on ship maintenance won't be cured that fast if the CR continues, as the fleet looks for overhauls that can be put off. None has been canceled so far. But if enough shipyards don't get that maintenance work, and similar work on 70 aircraft and 290 aircraft engines is deferred, up to 1,300 private sector jobs might be lost, the Navy source said.

## \*\*\*Radar/Lasers\*\*\*

## Radar Scenario

### US Situational awareness has a hole that only Restructured Radars can fill

Dinerman 7(Taylor Dinerman, Journalist at the Space Review, “Solar Power Satellites and Space Radar”, http://www.thespacereview.com/article/910/1, 7/16/07) SV

Using power from an SPS, such a satellite would be able to liberally use its ion engines to change its orbit. These engines would never be powerful enough to make the kind of quick responsive maneuvers that some space operations commanders would like to see in future LEO-based spacecraft, but they would be a step in the right direction. The demise of the E-10 program that had been intended to replace the Air Force’s JSTARS and AWACS surveillance aircraft has left a hole in future US situational awareness capabilities that neither unmanned aerial vehicles (UAVs), such as the Predator and Global Hawk, nor existing satellite programs can possibly fill. Space Radar could do so, but only if the program is restructured to make it at once more ambitious in terms of future capability and less ambitious in terms of near-term operations.

### SBSP is key to successful restructured radar programs

Dinerman 7(Taylor Dinerman, Journalist at the Space Review, “Solar Power Satellites and Space Radar”, http://www.thespacereview.com/article/910/1, 7/16/07) SV

Why, then, does such a system need to rely 100% on its own power? If solar power satellites (SPS) were available in geosynchronous orbit and could beam electricity to the SR satellites in LEO, this might allow the radar satellites to have as much power as their power control systems and heat radiators could handle. Power could be transmitted by a tightly focused laser or microwave beam to one or two receptors, integrated into the spacecraft’s bus. If the radar antenna were integrated into the skin of the satellite the way it is on a B-2 bomber, such satellite would be difficult to detect and track.

### SPS protects situational awareness satellites against ASATs – facilitates satellite reconstitution and enhances survivability

Ramos 2k (Kim, USAF Major and professor at the Air Command and Staff College Air University, “Solar Power Constellations Implications for the US Air Force.” April 2000. <https://www.afresearch.org/skins/rims/q\_mod\_be0e99f3-fc56-4ccb-8dfe-670c0822a153/q\_act\_downloadpaper/q\_obj\_73510976-ad5e-4d5d-a51c-a7103406f67d/display.aspx?rs=enginespage>)

As outlined in Air University study Spacecast 2020, the rapid launch and deployment of satellites is required to comply with the United States National Military Strategy concept of reconstitution. Reconstitution for space is the ability to launch satellites for “unanticipated system failures … [due to hostile actions] and multiple area coverage requirements, [which] … require the immediate placement of satellites into orbit.” 21 Solar power satellites enable reconstitution with unmanned aerial vehicles performing the same functions as satellites, as mentioned previously, and through enabling smaller satellites. One of the difficulties in achieving small satellites is the fact that power generation takes up about 25% of the weight of a satellite. 22 Satellites launched without onboard power generation would be smaller and receive power on orbit from a solar power satellite. Solar power satellites enable reconstitution with unmanned aerial vehicles with unlimited loiter time for immediate deployment for a warfighter, and by reducing the size of satellites which facilitates rapid launches. Small Satellites Small satellites not only fulfill the reconstitution requirement but also meet other requirements for smaller, faster, and cheaper satellites. Typically weighing less than 250 kg, and designed for one mission, “quick checkout and rapid launch,” small satellites offer advantages over larger satellites, which are more expensive, cost more to put in orbit, and take longer to build. 23 Small satellites are good candidates for imagery, and some types of communications. 24 Constellations of small satellites serve another purpose. They have reduced vulnerability and increased survivability compared to single satellites. Powering small satellites with energy beamed from a solar power satellite further reduces their size, cost, and launch requirements. Maneuver One of the vulnerabilities of satellites is that they lack maneuverability. Orbit changes are possible but the amount of station keeping fuel limits these maneuvers. Unscheduled orbital maneuvers for, supported warfighters, on-orbit station keeping, or avoiding an anti-satellite weapon, reduce the life expectancy of satellites. The New World Vistas study concluded, “technologies to substantially enhance survivability are …maneuvering technologies…enabled by the technologies of high generation power in space.” 25 Moreover, the report stated that electrical propulsion and solar power satellites would enable maneuvering for survivability, station keeping, and repositioning to meet warfighter requirements.

### Enhanced Space situational awareness deters current Chinese modernization efforts- absent prevention military escalation will increase

Blair and Yali 6[*China Security* Published by the World Security Institute and produced jointly with the Chen Shi China Research Group Bruce G. Blair is the President of the World Security Institute. Chen Yali is the editor-in-chief of Washington Observer] http://www.wsichina.org/attach/china\_security2.pdf**hn**

Greater situational awareness through enhanced monitoring and surveillance in space is also crucial to this idea of defense in space. One of the driving forces behind China’s efforts to research space debris identification and tracking is to also improve China’s ability to monitor military assets.68 The ability to identify and discriminate objects in space is crucial to evaluating threats from non-threats in space.The above constitute ‘comprehensive defensive actions,’ centered on capabilities to enhance survivability of China’s satellite networks, and ensure China’s access to space that is considered indispensable for future ‘informationalized warfare.’69At the heart of this defensive strategy is the need to protect against an adversary’s ability to prevent or restrict China from using space to its economic and national security advantage; that is, the ability to ‘deny the denial.’ It is the dual-use nature of China’s satellite program that will provide the means to achieve that comprehensive defense in space.For example, China’s plan to increase indigenous development and production capacity of durable and miniaturized satellites for missions of data transmission and Earth remote sensing is aimed primarily at civilian and commercial purposes.However, such technologies offer lower cost access to space with greater maneuverability and thus would have a direct impact on military space capability. China also intends to increase its capacity to launch on demand and achieve launch redundancy,70 which also could markedly enhance its military space potential**.** Chineseslogans such as ‘applying military to civilian,’ and ‘integrating military and civilian’ are used in official discussions to stress the integration and embedding of military with civilian technology development and production.71 Since the early 1990s, the revolution in military affairs has been the central theme for China’s military modernization program, of which space is an indispensable part.72 Such notions indicate the importance of a dual-use strategy.As for existent capabilities in space, although there is no official admission, China does have satellites for navigation, remote sensing, reconnaissance and communication that have military uses.73 These are mainly for ‘power enhancement and support’ capabilities. However, as others have noted, they remain vastly insufficient for gaining any real advantage vis-à-vis U.S. dominance in space74. Nevertheless, it is reasonable to assume that the number of these assets would Eric Hagt ~95~ grow substantially under the planned satellite development program and thus rapidly improve China’s force enabling capacity.

### Escalation causes extinction- results in resource depletion, economic collapse, and destruction of MAD

Bhagwat 10[Admiral Vishnu Bhagwat, former Chief of the Naval Staff, India “The Weaponization of Space: Corporate Driven Military Unleashes Pre-emptive Wars” October 17, 2010 http://www.globalresearch.ca/index.php?context=va&aid=21432]

As early as 1996, General Joseph Ashy , CinC US Space Command told ‘Aviation Week & Space Technology’ …. “Its politically sensitive …but its going to happen …some people do not want to hear this , but absolutely we are going to fight in Space , we’re getting to fight from space and we’re going to fight into space.” One analysis rightly concludes “that the US ( TCC ) is gearing up for the unilateral (military ) control of Space which over arches Planet Earth , all occupants and its entire contents --- with that vantage position it could overpower every opponent .” In chasing profits they boast of ‘blowing up the world,’ if necessary . However, there is many a slip, as the saying goes, between the cup and the slip . Post 2007 with the gathering financial implosion and indebtedness and loss of manufacturing capacity of the US system gathering visible momentum , the end game may turn out differently! According to some think tanks , only a few years ago , they declared that …. “Other nations lack the money and / or technology to compete with the US in the developing of space age weapons , Friedman is quoted for instance ,…..that China and Russia were passing blips.” In fact China, and to a lesser extent Russia , are the bankrupt US Treasury’s creditors ….China has been indirectly financing the Corporate wars in Afghanistan and Iraq…the US global military presence and the US Space Command’s growing dreams . But illusions can be dangerous by sparking off an uncontrolled arms Race in Space with its attendant risks and unexpected consequences that may blow up planet earth, notwithstanding the fact that the US economy is in terminal decline while its corporate warriors of the Transnational capitalist class profit and retain their wealth and riches in diverse financial securities , albeit toxic ones like Derivatives , CDOs and CDSs and other commercial paper in a huge ponzi web of deceit. We are indeed as the Chinese say living in interesting times. As US Space Command’s drives ahead with building Space WMD systems and synergizing with Ballistic Missile Defense , National Missile Defense and Anti-Satellite ( ASAT ) weapon sysytems , China and Russia will enter with defensively oriented systems and if China does , India will follow and Pakistan too . The whole game is counter –productive and result in more ‘Mutually Assured Destruction’ ( MAD ) as with nuclear weapons ….but not in the minds of the Transnational capitalist class which loves the Midas touch . The ‘Outer Space Treaty 1967 , was signed and sealed by the US , Soviet Union , China and India among others . The Outer Space treaty is a legally binding instrument . however it has a caveat ,which by omission permits the ‘passive military use of space .’ The Prime Ministers of Canada and Russia at the Millenium Summit in September 2000 and again in a meeting in December 2000 promised to work in close cooperation to prevent an arms race in Space. In a well reasoned paper presented to a Conference on Disarmament in Space , held in Moscow in 2001 , Dr Rebecca Johnson , Executive Director of the Acronym Institute for Disarmament Diplomacy called for a step by step ‘Ottawa Process’ and referred to a constructive working paper tabled by France at the Conference on Disarmament ( CD ) in Geneva. Dr Rebecca Johnson also suggested that a number of American companies with interests in Telecom , Navigation and Entertainment industries have a stake in keeping Space peaceful . She made another relevant observation that ‘Demilitarisation of Space is linked to ‘Demilitarisation of International Relations.’ Recalling Srilanka’s contribution to a proposed moratorium on testing ASAT weapons and for a discussion on a ‘Rules of the Road’ for Space in an attempt to pre-empt weaponisation of Space; the Srilankan ambassador to the CD , Geneva , Jayantha Dhanapala , as early as 1985, emphasized with rare foresight that “preventing an arms race in outer space is an easier task than attempting to control and decelerate such a race after it has begun... therefore, the urgency, to prohibit through multi-lateral negotiations the stationing of weapons in space designed to damage , destroy or interfere with any country’s space craft.” It would be ideal if the BMD and NMD projects are also halted , if not on the realization of their practical futility , then simply because the coming ‘Greatest Depression’ must lead to a major review and recall on grounds of financial non-feasibility alone. An eminent thinker and analyst in the global network for preservation of the space sanctuary has spoken thus : “ It wont do much good to anti-war people to demand an end to the war in Iraq, Afghanistan , nuclear war , weaponisation of Space ….unless they ( we ) mobilize the millions to demand the end of the underlying system , profit is all the human being nothing, that has now produced quasi-permanent war , conflict, violence, tension and sectarian strife (death squads and PMC personnel masquerading as Special Operation Groups with remote control drone bombers outside the control of any democratic institution of the State system / apparatus .)” We are threatened with the destruction and decimation of peoples and nations the world over , including the destruction of the life-sustaining resources of mother earth .

## ASATs Scenario

### SPS protects against ASAT – facilitates satellite reconstitution and enhances survivability

Ramos 2k (Kim, USAF Major and professor at the Air Command and Staff College Air University, “Solar Power Constellations Implications for the US Air Force.” April 2000. <https://www.afresearch.org/skins/rims/q\_mod\_be0e99f3-fc56-4ccb-8dfe-670c0822a153/q\_act\_downloadpaper/q\_obj\_73510976-ad5e-4d5d-a51c-a7103406f67d/display.aspx?rs=enginespage>)

As outlined in Air University study Spacecast 2020, the rapid launch and deployment of satellites is required to comply with the United States National Military Strategy concept of reconstitution. Reconstitution for space is the ability to launch satellites for “unanticipated system failures … [due to hostile actions] and multiple area coverage requirements, [which] … require the immediate placement of satellites into orbit.” 21 Solar power satellites enable reconstitution with unmanned aerial vehicles performing the same functions as satellites, as mentioned previously, and through enabling smaller satellites. One of the difficulties in achieving small satellites is the fact that power generation takes up about 25% of the weight of a satellite. 22 Satellites launched without onboard power generation would be smaller and receive power on orbit from a solar power satellite. Solar power satellites enable reconstitution with unmanned aerial vehicles with unlimited loiter time for immediate deployment for a warfighter, and by reducing the size of satellites which facilitates rapid launches. Small Satellites Small satellites not only fulfill the reconstitution requirement but also meet other requirements for smaller, faster, and cheaper satellites. Typically weighing less than 250 kg, and designed for one mission, “quick checkout and rapid launch,” small satellites offer advantages over larger satellites, which are more expensive, cost more to put in orbit, and take longer to build. 23 Small satellites are good candidates for imagery, and some types of communications. 24 Constellations of small satellites serve another purpose. They have reduced vulnerability and increased survivability compared to single satellites. Powering small satellites with energy beamed from a solar power satellite further reduces their size, cost, and launch requirements. Maneuver One of the vulnerabilities of satellites is that they lack maneuverability. Orbit changes are possible but the amount of station keeping fuel limits these maneuvers. Unscheduled orbital maneuvers for, supported warfighters, on-orbit station keeping, or avoiding an anti-satellite weapon, reduce the life expectancy of satellites. The New World Vistas study concluded, “technologies to substantially enhance survivability are …maneuvering technologies…enabled by the technologies of high generation power in space.” 25 Moreover, the report stated that electrical propulsion and solar power satellites would enable maneuvering for survivability, station keeping, and repositioning to meet warfighter requirements.

### ASATs destroy US capability – damage imaging and missiles

Easton 9 (Ian, senior fellow for the Project 2049 Institute, a research institute studying military outer space programs, “The Great Game in Space: China’s Evolving ASAT Weapons Programs and Their Implications for Future U.S. Strategy,” Jun 19, 2009. <http://project2049.net/documents/china\_asat\_weapons\_the\_great\_game\_in\_space.pdf>)

China’s direct-ascent ASATs pose a serious challenge to U.S. photographic intelligence (PHOTINT), electro-optical (EO), synthetic aperture radar (SAR), and electronic intelligence (ELINT) satellites that operate in low-earth orbit (LEO). According to Desmond Ball, a stockpile of around 20 direct-ascent ASATs would be needed to guarantee the destruction of the six or seven EO/SAR satellites that are thought to currently constitute the bulk of classified U.S. national security space imaging. 16 A further 20 such weapons would be needed to guarantee the destruction of the four co-orbiting groups of three sub-satellite units (SSU) the U.S. Navy uses to locate enemy warships and ground-based air defense systems with which it can then target with its over-the-horizon, satellite-guided cruise missiles. 17 The loss of these EO/SAR/ELINT platforms, which are probably the main targets of China’s direct-ascent ASAT weapons, would be a very serious blow to the U.S. at the outset of any conflict. Aside from the direct-ascent KKV China has successfully tested, it is also possible that direct-ascent ASATs could be armed with the electro-magnetic pulse (nuclear or non-nuclear) warheads that the PLA is also developing for its anti-ship ballistic missile (ASBM) program, which is based upon similar technology as China’s ASAT program. 18 Such a weapons system would be serious (and rather indiscriminate) threat to a large number of civilian and military satellites in LEO, as well as those in highly elliptical orbits. China may feel that the use of such a device would be warranted in order to guarantee a survivable nuclear deterrent in the face of recent U.S. missile defense related infrared satellite deployments.

### ASATs eliminate US power in the Pacific

Easton 9 (Ian, senior fellow for the Project 2049 Institute, a research institute studying military outer space programs, “The Great Game in Space: China’s Evolving ASAT Weapons Programs and Their Implications for Future U.S. Strategy,” Jun 19, 2009. <http://project2049.net/documents/china\_asat\_weapons\_the\_great\_game\_in\_space.pdf>)

China has also been developing (and in some cases fielding) cyber warfare units to hack into space control systems; co-orbital ASAT systems to covertly disable enemy satellites; radiofrequency weapons to jam satellite signals; and high-powered microwave weapons to destroy satellites from Earth. Some of these systems have been in development for over a decade, and the cyber warfare and laser programs are particularly mature. 25 In terms of co-orbital ASAT development, China’s recent BX-1 micro-satellite test, which was carried out as a part of the manned Shenzhou-7 mission, demonstrated technology that can be used as a base for future covert satellite inspection missions, as well as co-orbital ASAT attacks. The BX-1 test was particularly notable for the fact that it pasted within 25 km of the International Space Station (ISS) in what may have been a simulated attack run. 26 In the near future, it is possible that China could use this technology to launch co-orbital, micro-satellite ASAT weapons from its Xichang Satellite Launch Center (or Base 27) to attack U.S. national security satellites in GEO. Looking longer term, such weapons could potentially be launched using road-mobile launchers as well. The summation of this broad and assertive Chinese ASAT weapons program is a clear challenge to U.S. space operations, and by way thereof, nearly all modern U.S. war fighting capabilities. This fact has not gone unnoticed, especially in the Pacific theater of operations, where the U.S. is especially reliant upon its space assets.

### ASATs cause escalation in Taiwan war

Easton 9 (Ian, senior fellow for the Project 2049 Institute, a research institute studying military outer space programs, “The Great Game in Space: China’s Evolving ASAT Weapons Programs and Their Implications for Future U.S. Strategy,” Jun 19, 2009. <http://project2049.net/documents/china\_asat\_weapons\_the\_great\_game\_in\_space.pdf>)

Many specialists also argue that aside from the U.S. military dependency on orbital space, the U.S. economy, and in turn, much of the world economy, is also rapidly becoming dependent on space-based systems. They posit that, in effect, the U.S. is now a “space faring” nation whose very way of life is tied to the myriad capabilities provided by the orbital space medium. War games conducted as part of U.S. national security protocols, such as the Army-After-Next, Navy Global and Air Force Global Engagement series, Space Game 2 and Schriever 1 & 2, as well as the privately conducted “DEADSATS” war games, conducted from the late 1990s and the early 2000s, confirm this view. According to some space experts who were intimately involved with the war games, the exercises exposed “a critical national Achilles heel that politicians, economists and corporate CEOs have largely ignored…losses in space can quickly affect the economic, social, and national security fabric not only of the United States, but of the entire world.” These experts further speculate that “large military powers,” such as the United States, could “be held hostage by the unknowns inherent in a new kind of war.” 36 These concerns are directly linked with China’s ASAT weapons and their potential applicability in any future U.S.-Sino conflict. A more recent war game, “Pacific Vision,” conducted by Pacific Air Forces (PACAF) underscored the vulnerability of the unprotected commercial communication satellite channels on which the Air Force relies, as well as its cyber and radar vulnerabilities to Chinese attack. 37 Any possible U.S. military contingency around the Taiwan Strait would require secure satellites as the U.S. becomes ever more reliant upon its space systems. Moreover, reconnaissance satellites are thought to limit the risk inherent in the build-up of forces that both the PRC and the U.S. could be expected to deploy to the region in the event of a crisis. However, if the U.S. was blinded as the result of a preemptive Chinese ASAT attack, the conflict could quickly escalate to a dangerous level. According to two experts on the subject, “if there is a great-power war in the twenty-first century, our crystal ball says that it will be between the United States and China over Taiwan, with a very serious potential for a horrible escalatory process.” 38 This underscores the gravity of the topic as well as the negative impact the Chinese shift towards fielding ASAT weapons could have.

## Ext- SBSP solves radar

### SBPS helps space radar – survivability and efficiency

Dinerman 7 (Taylor Dinerman, Consultant for DOD, Senior Editor at Hudson, “Solar Power Satellites and Space Radar,” 7/16/07. <http://www.thespacereview.com/article/910/1>

In order to achieve the power levels needed for an effective GMTI system using current technology, very large solar arrays would be needed. Even if these were to use the new Boeing solar cells that, according to the company, are more than 30% efficient, the arrays would still be much bigger than anything on any operational satellite. Such large arrays would make the SR spacecraft easy targets for enemy antisatellite weapons and would also produce so much drag while in low Earth orbit (LEO) that their lifespan would be shorter—perhaps much shorter—than current-generation reconnaissance satellites. Why, then, does such a system need to rely 100% on its own power? If solar power satellites (SPS) were available in geosynchronous orbit and could beam electricity to the SR satellites in LEO, this might allow the radar satellites to have as much power as their power control systems and heat radiators could handle. Power could be transmitted by a tightly focused laser or microwave beam to one or two receptors, integrated into the spacecraft’s bus. If the radar antenna were integrated into the skin of the satellite the way it is on a B-2 bomber, such satellite would be difficult to detect and track. Using power from an SPS, such a satellite would be able to liberally use its ion engines to change its orbit. These engines would never be powerful enough to make the kind of quick responsive maneuvers that some space operations commanders would like to see in future LEO-based spacecraft, but they would be a step in the right direction.

### SBPS increases radar coverage – better power generation

Ramos 2k (Kim, USAF Major and professor at the Air Command and Staff College Air University, “Solar Power Constellations Implications for the US Air Force.” April 2000. <https://www.afresearch.org/skins/rims/q\_mod\_be0e99f3-fc56-4ccb-8dfe-670c0822a153/q\_act\_downloadpaper/q\_obj\_73510976-ad5e-4d5d-a51c-a7103406f67d/display.aspx?rs=enginespage>)

One of the reasons space-based radar has a limited viewing area is lack of enough power generating capability. Although the National Security Strategy does not currently call for force application from space, one of the technological issues is generating enough power to enable force application technologies. A solar power satellite could supply the power required for these technologies. Coupling space-based radar with a solar power satellite enables the radar to increase its coverage. Finally, the commercial communications satellite industry is under study as a possible power-generating source. Should this occur, a deployed unit could receive its communications and power from one microwave beamed source.

### SBSP makes space-based radar realistic

Ramos 2k (Kim, USAF Major and professor at the Air Command and Staff College Air University, “Solar Power Constellations Implications for the US Air Force.” April 2000. <https://www.afresearch.org/skins/rims/q\_mod\_be0e99f3-fc56-4ccb-8dfe-670c0822a153/q\_act\_downloadpaper/q\_obj\_73510976-ad5e-4d5d-a51c-a7103406f67d/display.aspx?rs=enginespage>)

A space-based radar concept is currently in work at an Air Force Research Laboratory. It requires large amounts of electrical power and the engineers have found no optimum solution to the problem. 31 The space-based radar in use today is limited in resolution and coverage by on- orbit power. 32 As with the space-based laser and RF jamming device, a space-based radar receiving power from a solar power satellite eliminates this problem.

### We solve bistatic radar – counters ARM missiles and radar jammers

Naval Research Laboratory 9 (a US military scientific research institute, “Space-based Solar Power: Possible Defense Applications and Opportunities for NRL Contributions,” 10/23/09. <http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA513123>)

Bistatic radar systems are generally well-suited to several specific applications where they outperform conventional monostatic radars, especially in real-world tactical scenarios. Notably, bistatic radars are of particular value in countering anti-radiation missile (ARM) threats, retro-directive radar jammers, and stealth radar technologies. They are inherently capable of implementing some processes, notably cluttertuning, that are impossible for monostatic radars [2]. Any SBSP satellite delivering RF energy to the surface can be used in a “hitchhiker” configuration, where the same RF downlink used to provide power to ground users can also be used as a coherent source of that RF energy for bistatic radar implementations. SBSP satellites used as RF sources for bistatic radar applications possess advantages over and above those afforded by more traditional satellites (e.g., GEO communication satellites, and GPS). Initially, SBSP bistatic systems will be able to operate at much higher effective isotropic radiated power (EIRP) than other spaceborne sources, providing orders of magnitude higher illumination of the surface, resulting in much higher signal to noise ratio (SNR), which allows detection of targets with much lower radar cross sections and minimizes an already lower threat from surface jammers. Instead of relying on coincidental illumination from more traditional spaceborne sources, SBSP RF illumination can be directed to specific tactical areas of interest, providing an “on-demand” capability as an adjunct to the SBSP’s primary power transmission mission.

## Ext- Radar key to capabilities

### Radar jammers cripple US capability

Easton 9 (Ian, senior fellow for the Project 2049 Institute, a research institute studying military outer space programs, “The Great Game in Space: China’s Evolving ASAT Weapons Programs and Their Implications for Future U.S. Strategy,” Jun 19, 2009. <http://project2049.net/documents/china\_asat\_weapons\_the\_great\_game\_in\_space.pdf>)

China has also been developing (and in some cases fielding) cyber warfare units to hack into space control systems; co-orbital ASAT systems to covertly disable enemy satellites; radiofrequency weapons to jam satellite signals; and high-powered microwave weapons to destroy satellites from Earth. Some of these systems have been in development for over a decade, and the cyber warfare and laser programs are particularly mature. 25 In terms of co-orbital ASAT development, China’s recent BX-1 micro-satellite test, which was carried out as a part of the manned Shenzhou-7 mission, demonstrated technology that can be used as a base for future covert satellite inspection missions, as well as co-orbital ASAT attacks. The BX-1 test was particularly notable for the fact that it pasted within 25 km of the International Space Station (ISS) in what may have been a simulated attack run. 26 In the near future, it is possible that China could use this technology to launch co-orbital, micro-satellite ASAT weapons from its Xichang Satellite Launch Center (or Base 27) to attack U.S. national security satellites in GEO. Looking longer term, such weapons could potentially be launched using road-mobile launchers as well. The summation of this broad and assertive Chinese ASAT weapons program is a clear challenge to U.S. space operations, and by way thereof, nearly all modern U.S. war fighting capabilities. This fact has not gone unnoticed, especially in the Pacific theater of operations, where the U.S. is especially reliant upon its space assets.

## Ext- SBSP solves ASATs

### SPS solve satellite reconstitution

Ramos 2k (Kim, USAF Major and professor at the Air Command and Staff College Air University, “Solar Power Constellations Implications for the US Air Force.” April 2000. <https://www.afresearch.org/skins/rims/q\_mod\_be0e99f3-fc56-4ccb-8dfe-670c0822a153/q\_act\_downloadpaper/q\_obj\_73510976-ad5e-4d5d-a51c-a7103406f67d/display.aspx?rs=enginespage>)

In addition to terrestrial applications, solar power satellites are an enabler for space assets. The ability to rapidly reconstitute space assets is enabled by solar power satellites. With a solar power satellite on orbit, satellites launched without internal power production capabilities would be smaller and easier to launch. Small satellites are gaining popularity in an age of decreasing budgets and increasing demands for information provided from space. Solar power satellites are an enabler here also. A few solar power satellites may power a constellation of small satellites. To achieve smaller satellites, eliminate individual power production capabilities, this would then require the small satellites to receive power on orbit from a solar power satellite. To increase survivability of a satellite, new methods to increase its maneuverability are under study. Solar power satellites coupled with electric propulsion enable satellites to achieve maneuverability without decreasing operational life span.

## SBSP key to UAVs

### Beaming solves - expands payload and flight time

Naval Research Laboratory 9 (a US military scientific research institute, “Space-based Solar Power: Possible Defense Applications and Opportunities for NRL Contributions,” 10/23/09. <http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA513123>)

Current long-duration solar-powered UAV systems, while demonstrated to be feasible, are payload limited because a significant fraction of total vehicle mass must be dedicated to energy storage, usually in the form of batteries. Those batteries are essential to provide power during nighttime flight as well as to augment available solar power when the aircraft flies in attitudes or circumstances not favorable to solar energy collection. While significant advances in lightweight battery technology have been made in recent years, energy storage still comprises anywhere from 20% to 50% of total vehicle mass in flight-proven UAVs. Significant augmentation of overall UAV system capabilities is possible if a large fraction of that battery mass can be made available to the payload. SBSP, provided in concert with local insolation at the UAV, can result in far less battery mass being required on the aircraft. In addition to providing additional power during daylight operations, a network of SBSP satellites can provide nearly continuous power to the UAV during local night. In fact, at typical UAV cruise power requirements of 75 to 100 W and typical wing areas of 1.2 to 2 m 2 , all the flight power for the bird could conceivably be provided by RF or light transmission from SBSP without exceeding the 100 W/m 2 controlled area limit of exposure currently accepted as human-safe.

### SBSP allows for unlimited UAV flight time – direct beaming

Ramos 2k (Kim, USAF Major and professor at the Air Command and Staff College Air University, “Solar Power Constellations Implications for the US Air Force.” April 2000. <https://www.afresearch.org/skins/rims/q\_mod\_be0e99f3-fc56-4ccb-8dfe-670c0822a153/q\_act\_downloadpaper/q\_obj\_73510976-ad5e-4d5d-a51c-a7103406f67d/display.aspx?rs=enginespage>)

One of the requirements for these vehicles is that they must have long endurance, 7 which currently is not possible. Using a microwave beam for powered flight and to power on-board instrumentation increases the endurance of the vehicle. Theoretically, by powering the craft with a beam it would possess unlimited endurance. 8 The power transmitted to the unmanned vehicle could come from a solar power satellite in space or from a ground station. These vehicles would be part of a war fighting commander-in-chief’s arsenal. Unmanned aerial vehicles with various detection modules would serve as near earth satellites for regional coverage of events. This is especially important in areas where satellites are not available for coverage, the revisit time of a satellite is too long, or due to limited assets, sharing of satellite time takes place.

### UAVs key for informational superiority – only way to ensure success in regional conflict

Ramos 2k (Kim, USAF Major and professor at the Air Command and Staff College Air University, “Solar Power Constellations Implications for the US Air Force.” April 2000. <https://www.afresearch.org/skins/rims/q\_mod\_be0e99f3-fc56-4ccb-8dfe-670c0822a153/q\_act\_downloadpaper/q\_obj\_73510976-ad5e-4d5d-a51c-a7103406f67d/display.aspx?rs=enginespage>)

Unmanned aerial vehicles help achieve information superiority. Both joint and Air Force service visions define information superiority as vital. Joint Vision 2010 calls information superiority a technological innovation to enable dominant maneuver, precision engagement, focused logistics, and full-dimensional protection. It defines information superiority as “the capability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary’s ability to do the same.” Global Engagement: A Vision for the 21 Century Air Force expresses the Air Force’s vision for the future and defines its core competencies. One of the Air Force Core Competencies it describes is information superiority. It goes on to endorse the use of unmanned aerial vehicles to “explore their potential uses over a full range of combat missions ” 4 to achieve information superiority. Supported by the highest levels of the Department of Defense, the use of unmanned aerial vehicles to achieve information superiority in regional conflicts is increasing. High altitude and long endurance vehicles are in development for monitoring the atmosphere, environmental impact studies, and more important to the Air Force, for communications relays, surveillance, and missile defense. 5 Other military uses for such vehicles are reconnaissance, targeting, target designation, and battle damage assessment. 6

## SBSP key to lasers/BMD

### SPS enables space deterrence and laser BMD

Ramos 2k (Kim, USAF Major and professor at the Air Command and Staff College Air University, “Solar Power Constellations Implications for the US Air Force.” April 2000. <https://www.afresearch.org/skins/rims/q\_mod\_be0e99f3-fc56-4ccb-8dfe-670c0822a153/q\_act\_downloadpaper/q\_obj\_73510976-ad5e-4d5d-a51c-a7103406f67d/display.aspx?rs=enginespage>)

United States Space Command developed four operational concepts to guide their vision. One of those operational concepts is global engagement. The USSPACECOM Long Range Plan defines global engagement as an “integrated focused surveillance and missile defense with a potential ability to apply force from space.” 27 This application of force from space involves holding at risk earth targets with force from space. 28 New World Vistas identifies several force application technologies. One of the technological issues associated with developing these space force application technologies is that they all require large amounts of power generation. A solar power satellite can supply the required power. Two technologies in particular would benefit from integration with a solar power satellite, directed energy weapons, such as lasers, and jamming devices. The space-based lasers currently under study accomplish ground moving target indication, and air moving target indication, which would be part of missile defense. 29 The main difficulty with the laser is designing a power plant, which can produce the required energy in space without the enormous solar arrays required. By using a solar power satellite to beam power to the laser, this eliminates the problem.

## \*\*\*Space Leadership\*\*\*

## Space Leadership Scenario

### Control of Space is inevitable-It’s only a question of who

Dinerman 10 (Taylor Dinerman, Consultant for DOD, Senior Editor at Hudson,“National Space Policy: From Strength to Weakness, Part 2”, http://www.hudson-ny.org/1440/national-space-policy-strength-weakness-2, 7/29/11) SV

What is so worrisome about the new Obama space policy goals, released in the New Space Policy document on June 28th -- especially those programs related to the internationalization of American space power -- is that they create opportunities for those who would undermine this power. The objective of these people, has long been to ensnare Washington in a net of agreements, policies and treaties. Eventually these will make it impossible for the US to project force without passing first through what Senator John Kerry (D, MA) called a "Global Test, " which is to say getting the approval of the international elite for anything that requires the use or even the threat of force. **In fifty years or less, we will have transitioned from a global economy to one that is beginning to encompass the Solar System; the only question is whether the US will lead the way** and embed its values out there, or whether they will be someone else's. When the Obama administration released its report, most of the media stressed that the president was reaching out for an unprecedented level of "Global Cooperation" -- supposedly in contrast to the Bush administration's "unilateralist approach to space." This simplistic and limited view of the facts may fit within the mindset of the mainstream media, but it clashes not only with the historic facts, but also with political realities. For decades, America's space programs have been used to project power of both the hard and soft varieties. Allies have long benefited from indirect, and, in rare cases from direct access to the Defense Department's various space systems. Throughout the world, every minute of every day, people use the Global Positioning System (GPS) signals, most of the time without even realizing that they come from a set of US military satellites. In the civilian realm the International Space Station which is now almost complete has been largely built and paid for by US taxpayers.

### SBSP is key to maintain US space dominance

Shea 10 (Karen Cramer Shea, Staff Writer at the Space Journal, “Why Has SPS R&D Received So Little Funding?”, http://spacejournal.ohio.edu/issue16/shea.html, December 2010) SV

Space solar power has no serious technical issues standing in its way, but it is facing crippling policy dilemmas. By taking a new policy approach, we may be able to get out of a decades-long quagmire. Energy and space are within the mandate of the Department of Commerce. Help with the deployment of four full scale space solar power satellites will incentivize the launch industry to develop new technologies and more efficient techniques and facilities. The time is now for the development of space solar power. If the U.S. government commits to it as a matter of public policy, a new SPS industry will emerge, repaying the public investment many times over. If the U.S. does not do so, Japan, China, India or Russia will take the lead in space solar power development and the U.S. will continue to send billions of dollars a year abroad to insure that our energy needs are met.

### Space Hegemony is key to overall US leadership

Stone 11 (Christopher Stone, space policy analyst and strategist at The Space Review, “American leadership in space: leadership through capability”, http://www.thespacereview.com/article/1797/1, 3/14/2011) SV

Finally, one other issue that concerns me is the view of the world “hegemony” or “superiority” as dirty words. Some seem to view these words used in policy statements or speeches as a direct threat. In my view, each nation (should they desire) should have freedom of access to space for the purpose of advancing their “security, prestige and wealth” through exploration like we do. However, to maintain leadership in the space environment, space superiority is a worthy and necessary byproduct of the traditional leadership model. If your nation is the leader in space, it would pursue and maintain superiority in their mission sets and capabilities. In my opinion, space superiority does not imply a wall of orbital weapons preventing other nations from access to space, nor does it preclude international cooperation among friendly nations. Rather, it indicates a desire as a country to achieve its goals for national security, prestige, and economic prosperity for its people, and to be known as the best in the world with regards to space technology and astronautics. I can assure you that many other nations with aggressive space programs, like ours traditionally has been, desire the same prestige of being the best at some, if not all, parts of the space pie. Space has been characterized recently as “congested, contested, and competitive”; the quest for excellence is just one part of international space competition that, in my view, is a good and healthy thing. As other nations pursue excellence in space, we should take our responsibilities seriously, both from a national capability standpoint, and as country who desires expanded international engagement in space. If America wants to retain its true leadership in space, it must approach its space programs as the advancement of its national “security, prestige and wealth” by maintaining its edge in spaceflight capabilities and use those demonstrated talents to advance international prestige and influence in the space community. These energies and influence can be channeled to create the international space coalitions of the future that many desire and benefit mankind as well as America. Leadership will require sound, long-range exploration strategies with national and international political will behind it. American leadership in space is not a choice. It is a requirement if we are to truly lead the world into space with programs and objectives “worthy of a great nation”

### American hegemony is necessary to prevent a multitude of conflicts in every region of the world – a multipolar world would not solve global problems, but would only increase the likelihood of war

Kagan 7 [Robert, a senior associate at the Carnegie Endowment for International Peace and transatlantic fellow at the German Marshall Fund, “End of Dreams, Return of History, 6-19, http://www.realclearpolitics.com/articles/2007/07/end\_of\_dreams\_return\_of\_histor.html]

The jostling for status and influence among these ambitious nations and would-be nations is a second defining feature of the new post-Cold War international system**. Nationalism in all its forms is back**, if it ever went away, and so is international competition for power, influence, honor, and status. **American predominance prevents these rivalries from intensifying -- its regional as well as its global predominance**. Were the United States to diminish its influence in the regions where it is currently the strongest power, the other nations would settle disputes as great and lesser powers have done in the past: sometimes through diplomacy and accommodation but often **through confrontation and wars** of varying scope, intensity, and destructiveness. One novel aspect of such a multipolar world is that most of these powers would possess **nuclear weapons**. That could make wars between them less likely, or it could simply make them **more catastrophic**. It is easy but also dangerous to underestimate the role the United States plays in providing a measure of stability in the world even as it also disrupts stability. For instance, the United States is the dominant naval power everywhere, such that other nations cannot compete with it even in their home waters. They either happily or grudgingly allow the United States Navy to be the guarantor of international waterways and trade routes, of international access to markets and raw materials such as oil. Even when the United States engages in a war, it is able to play its role as guardian of the waterways. In a more genuinely multipolar world, however, it would not. Nations would compete for naval dominance at least in their own regions and possibly beyond. Conflict between nations would involve struggles on the oceans as well as on land. Armed embargos, of the kind used in World War i and other major conflicts, **would disrupt trade flows in a way that is now impossible**. Such order as exists in the world rests not merely on the goodwill of peoples but on a foundation provided by American power. Even the European Union, that great geopolitical miracle, owes its founding to American power, for without it the European nations after World War ii would never have felt secure enough to reintegrate Germany. Most Europeans recoil at the thought, but even today Europe 's stability depends on the guarantee, however distant and one hopes unnecessary, that the United States could step in to check any dangerous development on the continent. In a genuinely multipolar world, that would not be possible without **renewing the danger of world war**. People who believe greater equality among nations would be preferable to the present American predominance often succumb to a basic logical fallacy. They believe the order the world enjoys today exists independently of American power. They imagine that in a world where American power was diminished, the aspects of international order that they like would remain in place. But **that 's not the way it works**. International order does not rest on ideas and institutions. It is shaped by configurations of power. The international order we know today reflects the distribution of power in the world since World War ii, and especially since the end of the Cold War. A different configuration of power, a multipolar world in which the poles were Russia, China, the United States, India, and Europe, would produce its own kind of order, with different rules and norms reflecting the interests of the powerful states that would have a hand in shaping it. Would that international order be an improvement? Perhaps for Beijing and Moscow it would. But it is doubtful that it would suit the tastes of enlightenment liberals in the United States and Europe. The current order, of course, is not only far from perfect but also offers no guarantee against major conflict among the world 's great powers. Even under the umbrella of unipolarity, regional conflicts involving the large powers may erupt. War could erupt between China and Taiwan and draw in both the United States and Japan. War could erupt between Russia and Georgia, forcing the United States and its European allies to decide whether to intervene or suffer the consequences of a Russian victory. Conflict between India and Pakistan remains possible, as does conflict between Iran and Israel or other Middle Eastern states. These, too, could draw in other great powers, including the United States. Such conflicts may be unavoidable no matter what policies the United States pursues. But they are more likely to erupt if the United States weakens or withdraws from its positions of regional dominance. This is especially true in East Asia, where most nations agree that a reliable American power has a stabilizing and pacific effect on the region. That is certainly the view of most of China 's neighbors. But even China, which seeks gradually to supplant the United States as the dominant power in the region, faces the dilemma that an American withdrawal could unleash an ambitious, independent, nationalist Japan. In Europe, too, the departure of the United States from the scene -- even if it remained the world's most powerful nation -- could be destabilizing. It could tempt Russia to an even more overbearing and potentially forceful approach to unruly nations on its periphery. Although some realist theorists seem to imagine that the disappearance of the Soviet Union put an end to the possibility of confrontation between Russia and the West, and therefore to the need for a permanent American role in Europe, history suggests that conflicts in Europe involving Russia are possible even without Soviet communism. If the United States withdrew from Europe -- if it adopted what some call a strategy of "offshore balancing" -- this could in time **increase the likelihood of conflict** involving Russia and its near neighbors, which could in turn draw the United States back in under unfavorable circumstances. It is also optimistic to imagine that a retrenchment of the American position in the Middle East and the assumption of a more passive, "offshore" role would lead to greater stability there. The vital interest the United States has in access to oil and the role it plays in keeping access open to other nations in Europe and Asia make it unlikely that American leaders could or would stand back and hope for the best while the powers in the region battle it out. Nor would a more "even-handed" policy toward Israel, which some see as the magic key to unlocking peace, stability, and comity in the Middle East, obviate the need to come to Israel 's aid if its security became threatened. That commitment, paired with the American commitment to protect strategic oil supplies for most of the world, practically ensures a heavy American military presence in the region, both on the seas and on the ground. The subtraction of American power from any region would not end conflict but would simply change the equation. In the Middle East, competition for influence among powers both inside and outside the region has raged for at least two centuries. The rise of Islamic fundamentalism doesn 't change this. It only adds a new and more threatening dimension to the competition, which neither a sudden end to the conflict between Israel and the Palestinians nor an immediate American withdrawal from Iraq would change. **The alternative to American predominance** in the region **is not balance and peace**. It is further competition. The region and the states within it remain relatively weak. A diminution of American influence would not be followed by a diminution of other external influences. One could expect deeper involvement by both China and Russia, if only to secure their interests. 18 And one could also expect the more powerful states of the region, particularly Iran, to expand and fill the vacuum. It is doubtful that any American administration would voluntarily take actions that could shift the balance of power in the Middle East further toward Russia, China, or Iran. The world hasn 't changed that much. An American withdrawal from Iraq will not return things to "normal" or to a new kind of stability in the region. It will produce a new instability, one likely to draw the United States back in again. The alternative to American regional predominance in the Middle East and elsewhere is not a new regional stability. In an era of burgeoning nationalism, the future is likely to be one of intensified competition among nations and nationalist movements. Difficult as it may be to extend American predominance into the future**, no one should imagine that a reduction of American power or a retraction of American influence and global involvement will provide an easier path**.

## Ext- Solves space leadership

### Solar based space policy is key to beat China and Japan

**Cox 11** (William J. Cox, a retired prosecutor and public interest lawyer, author and political activist, “The Race for Space-Solar Energy”, http://www.truthout.org/race-space-solar-energy/1304186557, 4/30/11) SV

With funding ending next year for the space shuttle and in 2017 for the space station, the United States must decide upon a realistic policy for space exploration, or else it will be left on the ground by other nations, which are rapidly developing futuristic space projects. China is currently investing $35 billion of its hard-currency reserves in the development of energy-efficient green technology and has become the world's leading producer of solar panels. In addition, China has aggressively moved into space by orbiting astronauts and by demonstrating a capability to destroy the satellites of other nations. Over the past two years, Japan has committed $21 billion to secure space-solar energy. By 2030, the Japan Aerospace Exploration Agency plans to "put into geostationary orbit a solar-power generator that will transmit one gigawatt of energy to Earth, equivalent to the output of a large nuclear power plant." Japanese officials estimate that, ultimately, they will be able to deliver electricity at a cost of $0.09 per kilowatt-hour, which will be competitive with all other sources.

### SBSP is key to maintain US leadership and eliminate resource conflicts

**McCown 8** (Debra McCown, Reporter for the Bristol Herald Courier, “Dominion CEO Touts Using All Available Energy Options”, http://www2.tricities.com/news/2008/apr/08/-tri\_2008\_04\_08\_0010-ar-257011/, 4/8/2008) SV

Lt. Col. Paul Damphousse, of the National Security Space Office, spoke about a solution he thinks can replace fossil fuels -- including coal -- within the next four decades: space-based solar power. He said it's **an important technology to maintain U.S. leadership in the world while eliminating international conflicts that arise over energy resources**. "We consider that the fourth generation after wood, coal and oil," Damphousse said, adding that the technology is bringing the concept closer to reality.

## \*\*\*Other Heg Internal Links\*\*\*

## Military Technologies

### SSP has spinoffs - key to military dominance – laundry list

Hornitschek et al 8 (Mike, Colonel and military researcher - USAF, Coyote Smith – colonel and scientist - USAF, Paul Demphouss – Lt. Colonel USMC, “Strategic Importance,” Ad Astra Spring 2008. <http://www.nss.org/adastra/AdAstra-SBSP-2008.pdf>)

Because the NRC had already verified NASA’s “Fresh Look Study” conclusion that SSP was not science fiction but instead just a very massive engineering challenge to solve, the Caballeros focused on how to demonstrate that SSP could in fact be economically feasible. While DOE and NASA had previously failed to close the SSP business case by examining energy as the only delivered revenue stream, DoD has a voracious demand for many different capabilities beyond just energy. These capabilities include command and control, persistent surveillance, operationally-responsive space access, space control, orbital debris removal, and in-space construction and maintenance of large structures. Recognizing that technical advances are occurring exponentially around the globe, and that history has shown time and again that deliberate and sustained innovation is the engine that drives true economic and political power, the “Eureka!” moment came with the realization that all of the previous business case analyses failed to include the economic and national security benefits of sure spin-off technologies and ancillary capabilities associated with deployment of a major SSP system. This list included not only the capabilities previously described, but also space infrastructure, low-cost reusable space access, orbital maneuver capabilities, broad-area space radar surveillance and telecommunication, and space-to-space and ground-to-ground power beaming. The ancillary benefit list was so remarkably large that it became nearly as important as the actual energy SSP could provide—no one in the DoD had ever viewed SSP through this lens before.

# \*\*\* Add Ons/Ideas \*\*\*

## \*\*\*Water\*\*\*

## 2ac Water Scarcity Add On

### SSP solves inevitable global water conflict

Tobisaka and Slane 09 (Kent, Space Environment Specialist Ogle Enterprises, Fred, Space Infrastructure Foundation, The Vision for Producing Fresh Water Using Space Power, pdf, JG)

There is an escalating climate crisis that is stressing the Earth’s environment. It is partially a result of the increasing accumulation of carbon dioxide and methane greenhouse gases in the lower atmosphere. One area that is significantly affected is the water infrastructure around the planet including hydropower, flood defense, drainage, and irrigation systems. The effect of adverse climate change on freshwater systems aggravates population growth, weakening economic conditions, land‐use changes, and urbanization. In the western U.S., for example, **reduced water supplies plus increased demand are likely to provoke more interstate and urban–rural competition for over‐allocated water resources.** Seawater desalination has existed for decades and is a proven technology for supplying water in coastal areas. Continued population growth in coastal areas makes it economically feasible to begin considering seawater desalination as a larger source for metropolitan water supplies. Fresh water reclaimed from seawater is 15‐50% efficient depending upon the production process, which can be osmosis, distillation, or a hybrid of both. Offshore oil and gas platforms already use seawater desalination to produce fresh water for platform personnel and equipment. We propose, as California coastal oil and gas platforms come to the end of their productive lives, that they be re‐commissioned for use as large‐scale fresh water production facilities. Solar arrays, mounted on the platforms, are able to provide the power needed for seawater desalination during the daytime. However, for efficient fresh water production, including on oil platforms, a facility must be operated 24 hours a day. We propose the use of solar power transmitted from orbiting satellites (Solar Power Satellites – SPS) to substantially augment the solar array power generated from natural sunlight. The advantage of a SPS in geosynchronous orbit (GEO) is that it is able to produce power at nighttime, thus enabling 24 hours a day operations. A SPS would be conceptually similar to existing commercial communication satellites but with a much larger solar array. A single satellite could power at least one seawater distillation plant on a converted offshore oil platform during the night and supplement the power during the day to provide clean energy and water for urban or agricultural on‐shore areas. The center beam power from a SPS received at Earth’s surface is about ½ Sun. Production of industrial quantities of fresh water on re‐commissioned oil and gas platforms, using energy transmitted from solar power satellites, is a breakthrough concept for addressing the pressing climate, water, and economic issues of the 21st Century. It is a novel combination of mature technologies that provides new solutions. As such, we recommend sponsored, expert team feasibility studies to evaluate this vision for producing fresh water using space power.

### Water scarcity causes global war- most likely scenario for future conflict.

IRIN 06 (Humanitarian news and Analysis, In-depth: Running Dry: the humanitarian impact of the global water crisis, GLOBAL: Water is running out: How inevitable are international conflicts?, http://www.irinnews.org/InDepthMain.aspx?InDepthId=13&ReportId=61029, JG)

The world’s population is growing and water consumption is increasing, but water resources are decreasing. “The world is running out of water,” stated Tony Clarke and Maude Barlow, activists and experts on water issues, in their article ‘Water Wars’, published by the Polaris Institute in 2003. They said that by 2025, world population would increase to 2.6 billion more than the present day and water demands would exceed availability by 56 percent. **People will live in water-scarcity areas, and disputes over resources are inevitable.** There are currently 263 rivers and countless aquifers that either cross or demarcate international political boundaries, according to the Atlas of International Freshwater Agreement, and 90 percent of countries in the world must share these water basins with at least one or two other states. The Global Policy Forum, a United States-based nonprofit organisation with consultative status at the United Nations, uses the term ‘water-stress’ to describe situations in which each person in a country has access to less than 1,500 cubic meters of water each year. The term ‘water scarcity’ refers to situations in which each person in a country has access to less than 1,000 cubic meters of water per year. It is estimated that two-thirds of the world’s population will live in areas of acute water stress or water scarcity by 2025. Nowadays, tensions and disputes between countries are rising due to increasing problems of water scarcity, rapid population growth, degradation in water quality and uneven economic growth. “If current trends continue, we could be faced with a very grave situation,” said former Soviet Union President Mikhail Gorbachev, who is now president of the Green Cross International, an organisation that provides analysis and expertise in environmental and economic issues. The issue of water and the sharing of water has always been a key concern in the Middle East. Across watersheds of Jordan to the Tigris and Euphrates rivers, the potential for strife today is even higher than before, as the regions are running out of water as political insecurities increase. Since 1950, approximately 80 percent of all violent disputes over water resources globally have occurred in the Middle East. According to Aaron Wolf of the Transboundry Freshwater Dispute Database at Oregon University in the US, people living in the region for generations have taken for granted the availability of water. Only recently have they started to realise the shortage of this vital resource… …Two-thirds of the world’s population will live in an area of acute water scarcity In Southeast Asia, the nations of Bangladesh, India and Nepal dispute the best uses of water from the Ganges-Brahmaputra Basin. Tensions and disagreements over water are also erupting along the Mekong River in Indochina as well as around the Aral Sea in Eastern Europe. There have been longstanding disputes between Ethiopia, Sudan and Egypt over the Nile River: The vast majority of the river’s flows are used by Egypt, even though it originates in Ethiopia. “We generate about 85 percent of the total Nile waters,” said Misfinta Genny, Ethiopia’s deputy minister of water. “We have not utilised this resource at all so far. […] We must develop these resources, basically for the benefit of our people.” Egypt’s main concern is that Ethiopia would deplete the water supply before it reached Egypt, with serious implications for agriculture and small industries along the banks of the Nile. Competition for water is also on the rise within countries. Increasingly, **experts have cautioned that if certain countries do not improve water management and cooperation in the future, water wars are inevitabl**e. Former UN Secretary-General Boutros Boutros Ghali threatened that, **“The next war among countries will not be for oil or territorial borders, but only for the problem of water.”** According to the World Water Organization, a humanitarian network based in Montreal, Canada, there is a lengthy history of conflicts and tensions over water resources. The Pacific Institute for Studies in Development, Environment and Security began a project in the 1980s to trace all incidents and tensions originating from water issues. Water-related conflicts are chronologically presented from 3000 BC until the present day. The different categories and types of conflict based on the severity of the event include: • Control of water resources (state and nonstate actors): where water supplies or access to water is at the root of tensions; • Military tool (state actors): where water resources or water systems themselves are used by a nation or a state as a weapon during a military action; • Political tool (state and nonstate actors): where water resources or water systems themselves are used by a nation, state, or nonstate actor for a political goal; • Terrorism (nonstate actors): where water resources or water systems are either targets or tools of violence or coercion by nonstate actors; • Military target (state actors): where water resources or systems are targets of military actions by nations or states; • Development disputes (state and nonstate actors): where water resources or can be caused by using water as military tool, water systems are a major source of contention and dispute in the context of economic and social development. Water resources are crucial for domestic, industrial, agricultural, and environmental use. By controlling water resources, a country has the ability to control the economy and population. For instance, upstream regions or countries enjoy the benefit of using water flows firsthand, while downstream areas might receive lesser amounts of many watersheds across state borders. Cooperation between riparian states can be highly problematic. Industrial development or the expansion of agriculture can also cause water conflicts when the excessive use of water by one state affects the water supply of another. In India and China in particular, the massive and unregulated use of private pumps is depleting underground aquifers at unsustainable and unprecedented rates. Urbanisation has also disproportionately increased the demand for water for urban populations, when it is arguably their rural counterparts, with farms and livestock, who need more water. The problem of uneven water distribution and the deterioration in water quality due to pollution and chemical contamination all contribute to the emergence of tensions and conflicts both within and between states.

## Ext- Scarcity now 🡪 conflict

### Climate change causes water depletion – river runoff , flooding, Circulation patterens

Tobisaka and Slane 09 (Kent, Space Environment Specialist Ogle Enterprises, Fred, Space Infrastructure Foundation, The Vision for Producing Fresh Water Using Space Power, pdf, JG)

By 2050, climate change is projected to decrease the annual average river runoff and water availability in the mid‐latitude drier regions and the dry tropics while increasing runoff at high latitudes and in some wet tropical areas. What this means for the average person is that many semi‐arid and arid areas such as the Mediterranean Basin, western USA, southern Africa, Australia, and northeastern Brazil will likely see a decrease in their water supply. This trend will be contrasted with increased flooding, including during the winter, for northern Europe, central and northern USA, northern China, and the wet tropical regions in Southeast Asia, Africa, and South America. The IPCC notes that there may be longer‐term consequences of climate change than were previously thought. Their report identifies that carbon dioxide is increasingly absorbed into the world’s oceans, which raises their heat content and changes their circulation patterns. The latency, or ocean’s ability to transfer heat out, occurs on time‐scales of several hundreds of years and this suggests that climate change will continue on the order of many centuries rather than decades. Since the ocean heat is exchanged with the atmosphere through thermal coupling, there are probable consequences such as an additional rise in sea surface height due to thermal

### Climate Change is causing water shortages – Leads to Disease and Resource Wars

Tobisaka and Slane 09 (Kent, Space Environment Specialist Ogle Enterprises, Fred, Space Infrastructure Foundation, The Vision for Producing Fresh Water Using Space Power, pdf, JG)

The IPCC reports that climate change is affecting the water infrastructure around the planet. This infrastructure includes hydropower, flood defense, drainage, and irrigation systems as well as water management practices. The adverse effects of climate change on freshwater systems aggravate the impacts of other stresses such as those from population growth, changing economic activity, land‐use changes, and urbanization. Globally, water demand is projected to grow in the coming decades primarily due to population growth and increasing affluence. Regionally, more demand for irrigation water is expected. Because changes in moisture precipitation patterns affect agricultural and urban water use, **malnutrition and water scarcity on a global scale may become the most important health consequences of climate change**. For the western U.S., the projected warming by 2050 is very likely to cause large decreases in snowpack, earlier snowmelt, more winter rain events, increased peak winter flows and flooding, and reduced summer flows with secondary consequences of increased drought conditions, lower crop yields, and forest fires. **Overall, the reduced water supplies, coupled with increases in demand, are likely to exacerbate state‐to‐state and urban–rural competition for over‐allocated water resources.**

## Ext- SSP Solves Water

### SSP Solves Water Shortages – Distillation

Tobisaka and Slane 09 (Kent, Space Environment Specialist Ogle Enterprises, Fred, Space Infrastructure Foundation, The Vision for Producing Fresh Water Using Space Power, pdf, JG)

The use of solar arrays to generate power for seawater desalination is not a new idea nor is the idea of using heat flow tubes as part of the distillation process. Solar arrays are coupled with seawater desalination and are used in the eastern Mediterranean and Persian Gulf regions. The prime disadvantages of using solar arrays are that solar energy is limited to approximately half a day (no solar power at night) and seasonal Sun angles can further reduce solar array efficiency. In addition, clouds reduce power from solar arrays. If fresh water production were implemented using an offshore platform, **solar arrays are the best method to generate electrical power for either RO or distillation processes**. We describe below a way in which solar arrays can be augmented on offshore oil and gas platforms to achieve efficiency in fresh water production. For efficient fresh water production, a facility must be operated continuously, 24 hours a day. We propose the use of solar power from orbiting satellites (Solar Power Satellites – SPS) as a method to substantially increment the solar array power that is generated naturally from sunlight. SPS systems have been conceived and designed for nearly 4 decades but not yet demonstrated. The design concept is straightforward – use a large solar array structure in space, collect the electrical power needed to power a microwave or laser transmitter on the spacecraft, direct the beam to a solar array receiving antenna at the Earth’s surface that is sensitive to the beam’s microwave or laser frequency, and convert the received power at the Earth solar array into electricity. The advantage of a SPS in geosynchronous orbit (GEO) is that it is able to produce power 24 hours a day and, thus, power can be transmitted at night to the surface of the Earth. Minor outages of up to approximately an hour per day over a 2‐week period occur twice a year during the spring and fall equinoxes. Historically, SPS were envisioned for providing large‐scale electricity to towns or small cities. This is based on the fact that a single kilometer‐wide band of space at GEO experiences nearly enough solar flux in one year to equal the amount of energy contained within all known recoverable conventional oil reserves on Earth today. The size of an orbital solar array is still technically prohibitive to provide power for cities. However, our concept would use a satellite that is conceptually similar to existing commercial communication satellites but with a much larger solar array7. For comparison, the International Space Station (ISS) has a completed total power of 120 kW using 16 solar panels of approximately 5600 m2. A 2 MW SPS would require approximately 16 times the number of solar panels as the ISS, i.e., a configuration that is certainly much larger and technically challenging, but not unfeasible. A single 2MW‐class satellite can provide power for a Santa Barbara‐class seawater distillation plant on a converted offshore platform during the night and can supplement the power for operations during the day. Inefficiencies in the system are not considered here. SPS power received at the Earth’s surface is about ½ Sun in the center of the beam, day and night. Added to the normal daily solar power, this can provide enough power to run fresh water production facilities.

### SSP Solves – No downtime

Tobisaka and Slane 09 (Kent, Space Environment Specialist Ogle Enterprises, Fred, Space Infrastructure Foundation, The Vision for Producing Fresh Water Using Space Power, pdf, JG)

There is a convergence of many interests behind our proposed concept. First, it is an understatement to say that a strong interest exists in reducing a global carbon footprint as one part of mitigating climate change. This path includes the small com13 Space Water ponent of decommissioning oil and gas platforms off the coast of California. At the same time, there are growing demands for fresh water along coastal areas. If we additionally consider that there are technical advances towards realizing space‐based solar power, and we realize that niche markets may be the best first users for new technologies, then these convergent concepts combine into a compelling argument. That argument says – produce industrial quantities of fresh water on former offshore oil and gas platforms, use solar arrays for diurnal power, and augment it with spacebased solar power for aroundtheclock operation. This argument stimulates policy makers, business communities, and the public to make novel use of mature technologies in solving 21st Century problems.

## \*\*\*Ideas-need impacts\*\*\*

## Chinese Economy

### SBSP key to stop China collapse and solve dependency

**Dinerman 7** (Taylor Dinerman, Journalist at the Space Review, “China, the US, and space solar power”, http://www.thespacereview.com/article/985/1, 10/22/2007) SV

Now that the National Security Space Office’s (NSSO) space solar power study has been released and shows that the technology is well within America’s grasp, a set of decisions have to be made concerning how the US government should proceed. The idea that the government should fund a series of demonstration projects, as the study recommends, is a good place to start. Another aspect should be to study the impact that this technology will have on the political and economic future of the world. The biggest factor in world affairs in the next twenty or so years is the rise of China to true great power status. Leaving aside the political vulnerabilities inherent in any communist regime, the greatest danger to China’s future prosperity is its huge need for energy, especially electricity. According to an International Energy Agency estimate, demand for electricity in China will grow at an average annual rate of 4.8% from 2003 and 2025. China is already experiencing shortages. The Yangtze Delta region, which includes Shanghai and the provinces of Jiangsu and Zhijiang and contributes almost 20% of China’s GDP, faced capacity shortages of four to five gigawatts during peak summer demand in 2003. In spite of a furious effort to develop new power sources, including dam building and new coal-fired power plants, China’s economic growth is outstripping its capacity to generate the terawatts needed to keep it going. While China may turn to widespread use of nuclear power plants, the Communist Party leadership is certainly aware of the role that *glasnost* and the Chernobyl disaster played in the downfall of another Communist superpower. Thus, China may be reluctant to rely heavily on nuclear power plants, at least not without strong safety measures, thus making them more expensive and more time consuming to build. Wind power and terrestrial solar power will not be able to contribute much to meeting China’s demand and certainly not without government subsidies which a relatively poor nation such as China will be reluctant to provide. At some point within the next twenty or thirty years China will face an energy crisis for which it will be almost certainly unprepared. The crisis may come sooner if, due to a combination of internal and external pressures, the Chinese are forced to limit the use of coal and similar fuels. At that point their economic growth would stall and they would face a massive recession. Only a new source of electrical energy will insure that such a nightmare never happens. The global repercussions would be disastrous. In the near term **the only new source of electric power that can hope to generate enough clean energy to satisfy China’s mid- to long-term needs is space based solar power**. The capital costs for such systems are gigantic, but when compared with both future power demands and considering the less-than-peaceful alternative scenarios, space solar power looks like a bargain.

## Aerospace

### SBSP key to the aerospace industry.

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

An SBSP program as outlined in this report is remarkably consonant with the findings of this commission, which stated: The United States must maintain its preeminence in aerospace research and innovation to be the global aerospace leader in the 21st century. This can only be achieved through proactive government policies and sustained public investments in long‐term research and RDT&E infrastructure that will result in new breakthrough aerospace capabilities. Over the last several decades, the U.S. aerospace sector has been living off the research investments made primarily for defense during the Cold War…Government policies and investments in long‐term research have not kept pace with the changing world. Our nation does not have bold national aerospace technology goals to focus and sustain federal research and related infrastructure investments. The nation needs to capitalize on these opportunities, and **the federal government needs to lead the effort.** Specifically, it needs to invest in long‐term enabling research and related RDT&E infrastructure, establish national aerospace technology demonstration goals, and create an environment that fosters innovation and provide the incentives necessary to encourage risk taking and rapid introduction of new products and services. The Aerospace Commission recognized that Global U.S. aerospace leadership can only be achieved through investments in our future, including our industrial base, workforce, long term research and national infrastructure, and that government must commit to increased and sustained investment and must facilitate private investment in our national aerospace sector. The Commission concluded that the nation will have to be a space‐faring nation in order to be the global leader in the 21st century—that our freedom, mobility, and quality of life will depend on it, and therefore, recommended that the United States boldly pioneer new frontiers in aerospace technology, commerce and exploration. They explicitly recommended that the United States create a space imperative and that NASA and DoD need to make the investments necessary for developing and supporting future launch capabilities to revitalize U.S. space launch infrastructure, as well as provide Incentives to Commercial Space. The report called on government and the investment community must become more sensitive to commercial opportunities and problems in space. Recognizing the new realities of a highly dynamic, competitive and global marketplace, the report noted that the federal government is dysfunctional when addressing 21st century issues from a long term, national and global perspective. It suggested an increase in public funding for long term research and supporting infrastructure and an acceleration of transition of government research to the aerospace sector, recognizing that government must assist industry by providing insight into its long‐term research programs, and industry needs to provide to government on its research priorities. It urged the federal government must remove unnecessary barriers to international sales of defense products, and implement other initiatives that strengthen transnational partnerships to enhance national security, noting that U.S. national security and procurement policies represent some of the most burdensome restrictions affecting U.S. industry competitiveness. Private‐public partnerships were also to be encouraged. It also noted that without constant vigilance and investment, vital capabilities in our defense industrial base will be lost, and so recommended a fenced amount of research and development budget, and significantly increase in the investment in basic aerospace research to increase opportunities to gain experience in the workforce by enabling breakthrough aerospace capabilities through continuous development of new experimental systems with or without a requirement for production. Such experimentation was deemed to be essential to sustain the critical skills to conceive, develop, manufacture and maintain advanced systems and potentially provide expanded capability to the warfighter. A top priority was increased investment in basic aerospace research which fosters an efficient, secure, and safe aerospace transportation system, and suggested the establishment of national technology demonstration goals, which included reducing the cost and time to space by 50%. It concluded that, “America must exploit and explore space to assure national and planetary security, economic benefit and scientific discovery. At the same time, the United States must overcome the obstacles that jeopardize its ability to sustain leadership in space.” An SBSP program would be a powerful expression of this imperative.

## Commercial Space Industry

### Leads to spin-off tech – that solves space access and infrastructure as well as Earth tech

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

FINDING: The SBSP Study Group found that retirement of the SBSP technical challenges begets other significant strategic benefits for exploration, commerce and defense, that in‐and‐of‐themselves may justify a national program. • At present, the United States has very limited capabilities to build large structures, very large apertures or very high power systems in orbit. It has very limited in‐space maneuver and operational capability, and very limited access to space. It cannot at present move large amounts of mass into Earth orbit. The United States correspondingly has extremely limited capabilities for in‐space manufacturing and construction or in‐situ space resource utilization. It has no capability for beamed power or propulsion. SBSP development would advance the state of the art in all of the above competencies. • The expertise gained in developing large structures for space based solar power could allow entirely new technologies for applications such as image and real‐time surface and airborne object tracking services, as well as high bandwidth telecommunications, high‐definition television and radio, and mobile, broadcast services. It would enable entirely new architectures, such as power platforms that provide services to multiple payloads, autonomous self‐constructing structures, or wireless cooperative formations. The Solar Electric Transfer Vehicles (SETV) needed to lift the Space Solar Power Satellites out of low‐earth orbit, and perhaps even form its components, would completely revolutionize our ability to move large payloads within the Earth‐Moon system. • The technology to beam power over long distances could lower application satellite weights and expand the envelope for Earth‐ and space‐based power beaming applications. A truly developed Space‐Based Solar Power infrastructure would open up entirely new exploration and commercial possibilities, not only because of the access which will be discussed in the section on infrastructure, but because of the power available on orbit, which would enable concepts as diverse as comet / asteroid protection systems, de‐orbit of space debris, space‐to‐space power utilities, and beamed propulsion possibilities including far‐term concepts as a true interstellar probe such as Dr. Robert Forward’s StarWisp Concept.

### SBSP key to space commercialization

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

Finding: The SBSP Study Group found that SBSP appears to have significant growth potential in the long run, and a national investment in SBSP may return many times its value. Most of America’s spending in space does not provide any direct monetary revenue. SBSP, however, may create new markets and the need for new products that will provide many new, high‐paying technical jobs and net significant tax revenues. Great powers have historically succeeded by finding or inventing products and services not just to sell to themselves, but to others. Today, investments in space are measured in billions of dollars. The energy market is trillions of dollars, and there are many billions of people in the developing world that have yet to connect to the various global markets. Such a large export market could generate substantial new wealth for our nation and our world. Investments to mature SBSP are similarly likely to have significant economic spin‐offs, each with their own independent revenue stream, and open up or enable other new industries such as space industrial processes, space tourism, enhanced telecommunications, and use of off‐world resources. Not all of the returns may be obvious. SBSP is a both infrastructure and a global utility. Estimating the value of utilities is difficult since they benefit society as a whole more than any one user in particular—consider what the contribution to productivity and GDP are by imagining what the world would be like without electric lines, roads, railroads, fiber, or airports. Not all of the economic impact is immediately captured in direct SBSP jobs, but also in the services and products that spring up to support those workers and their communities. Historically such infrastructure projects have received significant government support, from land grants for railroads, to subsidized rural electrification, to development of atomic energy. While the initial‐capability on‐ramp may be slow, SBSP has the capability to be a very significant portion of the world energy portfolio by mid‐century and beyond.

## Nuke Power

### Solves prolif – avoids nuke power

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

Both fossil and fissile sources offer significant capabilities to our energy mix, but dependence on the exact mix must be carefully managed. Likewise, the mix abroad may affect domestic security. While increased use of nuclear power is not of particular concern in nations that enjoy the rule of law and have functioning internal security mechanisms, it may be of greater concern in unstable areas of rogue states. The United States might consider the security challenges of wide proliferation of enrichment‐based nuclear power abroad undesirable. If so, having a viable alternative that fills a comparable niche might be attractive. Overall, SBSP offers a hopeful path toward reduced fossil and fissile fuel dependence.

## Competitiveness

### Solves competitiveness – jobs and education

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

FINDING: The SBSP Study Group found that SBSP offers a path to address the concerns over US intellectual competitiveness in math and the physical sciences expressed by the Rising Above the Gathering Storm report by providing a true “Manhattan or Apollo project for energy.” In absolute scale and implications, it is likely that SBSP would ultimately exceed both the Manhattan and Apollo projects which established significant workforces and helped the US maintain its technical and competitive lead. The committee expressed it was “deeply concerned that the scientific and technological building blocks critical to our economic leadership are eroding at a time when many other nations are gathering strength.” SBSP would require a substantial technical workforce of high‐paying jobs. It would require expanded technical education opportunities, and directly support the underlying aims of the American Competitiveness Initiative.

## Colonization

### SBSP allows further Human expansion and eventually colonization of space

Hsu 7 (Feng Hsu, Senior Aerospace Engineer at NASA and a former research fellow of Nuclear Energy Dept., “Harnessing The SUN – Embarking On Humanity’s Next Giant Leap”, http://www.science20.com/david\_houle/harnessing\_the\_sun\_embarking\_on\_humanity\_s\_next\_giant\_leap, 10/11/2007) SV

Scientificblogging.com: Sounds like we need a global “Manhattan Project”. Should the United States take the lead and other nations will join later, or should there be a multi-governmental organization put in place first. Can the US do this alone? Hsu:  Yes, a “Manhattan Project” like major effort **led by the US** with participations from broad international community is what needed to a successful creation, implementation and operations of a commercial scale SSP system. Please remember, an inherent feature of solar power satellites is their location in earth orbit outside the borders of any individual nation with their energy delivered back to the earth by way of certain form of WPT (wireless power transmission). The applications of WPT must be compatible with other uses of the radio frequency spectrum in the affected orbital space. The SPS infrastructure must also be launched and delivered into space. Therefore, it is vital for international and government involvement to coordinate global treaties and agreements, such as covering frequency assignments, satellite locations, space traffic control and many other features of space operations that are mandatory in order to prevent international confrontations. I believe it is imperative for a multi-governmental organization or entity be put in place first for a major SSP project, and it will be extremely difficult, if not inconceivable, for the US or any single nation to do this alone at any useful or significant power scale due to the many political and technological reasons as stated. However, it is equally important that there must be a leading nation to provide the necessary leadership in such complex and interdependent international SSP effort. In a partnership of multiple governments and industries, it is vital that the leadership and responsibilities of the various project elements be clearly defined in order to prevent chaos. There should be some logical parameters to outline how this can be done. The key step is to establish a lead nation. The United States is the logical leader in this area because of the breadth of technology infrastructure and capability that already exists, as well as the magnitude of financial resources available in its industry and financial community. In any case, space solar power is going to be a gigantic yet achievable human technology and engineering endeavor, based on heritages of human ingenuity. We can go to the Moon; we can achieve splitting atoms; we can also overcome the inefficacy problems of the solar-electric conversion, and we can achieve the goal for affordable access to space and hence making the SSP a cost competitive energy production for all of humanity. **Key SSP component technologies will also enable human economic expansion and settlement into space, which is utterly important for the permanent survival of our species**. To this end, such a “vertical expansion of humanity” into our solar system in the new millennium can be every bit as important (if not far more critical) as the “horizontal expansion” achieved by our ancestors since the 1400s.  Indeed, **SSP will provide an ideal platform for promoting human collaborations that will help reduce the global economy imbalances**. It can be also a major steppingstone for humanity’s next giant leap for harnessing the Sun and transforming the combustion world economy into the solar-electric human civilization that is likely to transpire and elevating our species.

# \*\*\*Solvency\*\*\*

## US Key

### Whoever sets up SSP first controls the game

O’Neill 08 (Ian, Universe Today, Harvesting Solar Power from Space, http://www.universetoday.com/14646/harvesting-solar-power-from-space/, JG)

In a new report, the viability of sending solar panels into space to collect a vast quantity of uninterrupted energy has been re-investigated. Although the idea has been around since the 1970′s, space solar power has always been viewed as prohibitively expensive. In the current energy climate down here on Earth with spiralling oil prices and a massive push toward green energy sources, sending massive solar arrays into geosynchronous orbit doesn’t seem like such a strange (or expensive) idea. There are many obstacles in the way of this plan, but the international community is becoming more interested, **and whoever is first to set up an orbital array will have a flexible and unlimited energy resource…** It sounds like the perfect plan: build a vast array of solar panels in space. This avoids many of the practical problems we have when building them on Earth such as land availability, poor light conditions and night time, but sending a sunlight farm into space will be expensive to set up. In the 1970′s a plan was drawn up by NASA for the possibility of orbital sunlight “harvesting”, but it was deemed too expensive with a hefty price tag of at least $1 trillion. There was no country in the world that could commit to such a plan. But as we slowly approach an era of cheaper space travel, this cost has been slashed, and the orbital solar energy case file has been re-opened. Surprisingly, it isn’t the most developed nations in the world that are pushing for this ultimate renewable energy source**. India and China, with their ballooning populations are reaching a critical point for energy consumption and they are beginning to realize their energy crisis may be answered by pushing into space**. “*A single kilometer-wide band of geosynchronous Earth orbit experiences enough solar flux in one year to nearly equal the amount of energy contained within all known recoverable conventional oil reserves on Earth today*.” – Pentagon’s National Security Space Office 2007 report. So how could this plan work? Construction will clearly be the biggest expense, but the nation who leads the way in solar power satellites will bolster their economy for decades through energy trading. The energy collected by highly efficient solar panels could be beamed down to Earth (although it is not clear from the source what technology will go into “beaming” energy to Earth) where it is fed into the national grid of the country maintaining the system. Ground based receivers would distribute gigawatts of energy from the uninterrupted orbital supply. This will have obvious implications for the future high demand for electricity in the huge nations in Asia and will wean the international community off carbon-rich non-renewable resources such as oil and coal. There is also the benefit of the flexible nature of this system being able to supply emergency energy to disaster (and war-) zones. “*It will take a great deal of effort, a great deal of thought and unfortunately a great deal of money, but it is certainly possible.*” – Jeff Keuter, president of the George C. Marshall Institute, a Washington-based research organization. The most optimistic time frame for a fully operational space-based sunlight collection satellite would be 2020, but that is if we started work now. Indeed some research is being done (Japan is investing millions of dollars into a potential prototype to be put into space in the near future), but this is a far cry from planning to get full-scale operations underway in a little over a decade…

## Technologically Feasible

### We’re technologically ready – materials and energy advances prove

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

FINDING: The SBSP Study Group found that Space‐Based Solar Power is a complex engineering challenge, but requires no fundamental scientific breakthroughs or new physics to become a reality. Space‐Based Solar Power is a complicated engineering project with substantial challenges and a complex trade‐space not unlike construction of a large modern aircraft, skyscraper, or hydroelectric dam, but does not appear to present any fundamental physical barriers or require scientific discoveries to work. While the study group believes the case for technical feasibility is very strong, this does not automatically imply economic viability and affordability—this requires even more stringent technical requirements. FINDING: The SBSP Study Group found that significant progress in the underlying technologies has been made since previous government examination of this topic, and the direction and pace of progress continues to be positive and in many cases accelerating. - 20 - • Significant relevant advances have occurred in the areas of computational science, material science, photovoltaics, private and commercial space access, space maneuverability, power management, robotics, and many others. • These advances have included (a) improvements in PV efficiency from about 10% (1970s) to more than 40% (2007); (b) increases in robotics capabilities from simple tele‐operated manipulators in a few degrees of freedom (1970s) to fully autonomous robotics with insect‐class intelligence and 30‐100 degrees of freedom (2007); (c) increases in the efficiency of solid state devices from around 20% (1970s) to as much as 70%‐90% (2007); (d) improvements in materials for structures from simple aluminum (1970s) to advanced composites including nanotechnology composites (2007); and many other areas.

### SBSP is technologically feasible

Lemonick 09 (Michael, senior writer at Climate Central, Yale Environment 360, Solar Power from Space: Moving Beyond Science Fiction, http://e360.yale.edu/content/feature.msp?id=2184, JG)

But there is a way to tap into the sun’s energy 24 hours a day, every day of the year, and send it anywhere on the globe: Launch solar panels into space and beam the power back to Earth. The concept sounds far-fetched and wildly impractical, and when the Pentagon and space enthusiasts began talking about it back in the 1960s and 1970s, it was. Recently, however, the idea of space-based solar power, or SBSP, has begun to look less like science fiction and more like a technology whose time may be coming, with the Pentagon and private companies ramping up efforts to make space-based solar power a reality. Image Gallery Solar ©Mafic Studios, Inc. HOW IT WORKS: Beaming space-based solar power back to Earth Two years ago, the Pentagon’s National Security Space Office (NSSO) issued a report recommending that the U.S. “begin a coordinated national program to develop SBSP.” A year ago, engineers did a small but successful experiment using some of the technology that will be employed in SBSP, taking energy from solar cells, converting it to microwaves, and then beaming it 92 miles from Maui to the Big Island of Hawaii, where it was converted back into 20 watts worth of electricity. And last spring, the California-based Solaren Corporation signed a contract with Pacific Gas & Electric (PG&E) to provide 200 megawatts of power — about half the output of an average coal-fired power plant — by 2016 by launching solar arrays into space.

### Solvency Attainable – Planning leads to mastery of industrial space and SSP

Snead 09 (James M, The Space Review, The Vital Need For America to Develop Space Solar Power, http://www.thespacereview.com/article/1364/1, JG)

Successfully developing SSP and building the integrated spacefaring logistics infrastructure necessary to demonstrate SSP and prepare for serial production of the geostationary platforms can only be successfully undertaken by a true spacefaring nation. The United States is not there yet because, as the US National Space Policy emphasizes, we have not yet developed the “robust, effective, and efficient space capabilities” needed for America to effectively utilize space this century. Planning and executing a rational US energy policy that undertakes the development of SSP will jump-start America on the path to acquiring the mastery of industrial space operations we need to become a true spacefaring nation. This path will follow our nation’s hard-earned success, as seafarers and aviators, of building a world-leading maritime industry in the 18th and 19th centuries and an aviation industry in the 20th century. With this new spacefaring mastery, today’s dreams of expanded human and robotic exploration of space, of humans on Mars, of space colonies, of lunar settlements, and so on, will all move from the realm of wishful daydreams into an exciting future of actionable possibilities. The goal of nearly all American pro-space organizations is to make such a future a reality. Energetically supporting the incorporation of SSP into US energy planning and strongly advocating for the start of the development of SSP is how pro-space organizations can now take action to make their vision part of America’s broad-based spacefaring future. This is, indeed, a win-win opportunity that we cannot afford to miss.

### All tech is within reach

Lemonick 09 (Michael, senior writer at Climate Central, Yale Environment 360, Solar Power from Space: Moving Beyond Science Fiction, http://e360.yale.edu/content/feature.msp?id=2184, JG)

Several other companies have announced their intentions to put up solar satellites of their own. Doubts abound that space-based solar power will come to pass anytime soon, and for good reason: The technology involves launching a series of large satellites into space, using robotic technology to assemble the solar arrays, transmitting the energy 22,000 miles to earth using microwave technology, and then converting that energy to electricity on the ground. The fact is, however, that all of that is now feasible — if pricey — thanks to technological advances in recent years. These include cheaper and more reliable launch technology, lighter and stronger materials for solar stations, significant improvements in the robotic technology needed to assemble the solar arrays, far more efficient solar cells, more precise digital devices to direct that energy accurately to earth, and significantly smaller and more powerful microwave transmitters and receivers. The big question is whether this engineering feat can be pulled off at a price competitive with terrestrial solar power. So far, the Pentagon’s estimate of what it will cost — $10 billion to put a 10-megawatt experimental solar station in orbit by 2016 — is five times higher than Solaren’s and would produce far less power.

### We have the tech & we would be able to run/create SSP from space

NSS 07 (National Space Society, Space Solar Power Limitless clean energy from space, About Space Solar Power (SSP, also known as Space-Based Solar Power, or SBSP):, http://www.nss.org/settlement/ssp/, JG)

All of these technologies are reasonably near-term and have multiple attractive approaches. However, a great deal of work is needed to bring them to practical fruition. In the longer term, with sufficient investments in space infrastructure, space solar power can be built from materials from space. The full environmental benefits of space solar power derive from doing most of the work outside of Earth's biosphere. With materials extraction from the Moon or near-Earth asteroids, and space-based manufacture of components, space solar power would have essentially zero terrestrial environmental impact. Only the energy receivers need be built on Earth. Space solar power can completely solve our energy problems long term. The sooner we start and the harder we work, the shorter "long term" will be.

### We have the tech – Testing, Engineering and Safety Principles

Snead 09 (James M, The Space Review, The End of Easy Energy and What to Do About It, pdf, JG)

The intent of this overview of the potential of space solar power was to indicate that the physics and basic engineering principles of the design, construction, and use of space solar power are understood and have been demonstrated and that the basic safety aspects of power transmission have been investigated with acceptable preliminary findings. The brevity of this overview, however, should *not* be taken to indicate that developing and constructing a network of hundreds, potentially thousands, of massive SSP platforms in GEO will be easy and quick or that further in-depth safety, environmental, and operational impact investigations are not needed. Just the opposite is true. Hence, pursuing SSP will need to involve:

## Deployed Quickly

### Fully-operational SBSP possible within 4 years

Atkinson 9 (Nancy, a science journalist, Senior Editor for Universe Today, and a NASA/JPL Solar System Ambassador, “New Company Looks to Produce Space Based Solar Power Within a Decade”, 2-18-09, http://www.universetoday.com/25754/new-company-looks-to-produce-space-based-solar-power-within-a-decade/) OP

“Although it’s a very grandiose vision, it makes total sense,” Sage told Universe Today. “This is an inevitable technology; it’s going to happen. If we can put solar panels in space where the sun shines 24 hours a day, if we have a safe way of transmitting the energy to Earth and broadcasting it anywhere, that is a serious game changer.” If everything falls into place for this company, they could be producing commercially available SBSP within a decade. The basic concept of SBSP is having solar cells in space collecting energy from sun, then converting the energy into a low intensity microwave beam, sending it down to Earth where it is collected on a rectenna, and then fed into the power grid to provide electricity. Almost 200 million gigawatts of solar energy is beamed towards the Earth every second, which is more energy than our civilization has used since the dawn of the electrical age. We only need a way to harness that energy and make it usable. Space Energy, Inc.’s vision is to help create an energy-independent world, and improve the lives of millions of people by bringing a source of safe, clean energy to the planet from space. They are looking to become the world’s leading, and perhaps the first, SBSP enterprise. Solar collector beaming energy to Earth. Image courtesy Mafic Studios. “The biggest challenge for SBSP is making it work on a commercial level in terms of bottom line,” said Sage, “i.e., putting together a business case that would allow the enormous infrastructure costs to be raised, the plan implemented, and then electricity sold at a price that is reasonable. I say ‘reasonable’ and not just ‘competitive’ because we’re getting into a time where selling energy only on a price basis isn’t going to be the criteria for purchase.” Currently, there are times in the US when electricity is sold wholesale for close to a dollar a kilowatt during peak usage or times of emergency when power needs to be shipped around the national grid. Sage said SBSP will never be cost comparable with the current going rate of 6 or 7 cents a kilowatt due to the enormous set-up costs. “We believe we can get it to a reasonable price, a fair market price as the demand for energy increases,” Sage said. A huge energy gap is looming for our world, and that too, will change the energy game. According to a white paper written by aerospace engineer James Michael Snead, “The End of Easy Energy and What Are We Going To Do About It,” in order to meet the world’s projected increase in energy needs by 2100 which likely will be at least three times what is being produced today, today’s sustainable energy production must expand by a factor of over 25. Under that scenario, even if the US were to build 70 new nuclear plants, add the equivalent of 15 more Hoover Dams, expand the geothermal capacity by 50 times what it is today, install over a million large land or sea wind turbines covering 150,000 square miles, build 60,000 square miles of commercial solar voltaic farms, and on top of that convert 1.3 billion dry tons of food mass to bio fuels, still only 30% of the power needs would be filled by 2100, or perhaps even earlier. “Looking at every single technology we can as a civilization to try and fill the energy gap in a clean and resourceful, sustainable way, technologies like SBSP have to be made to work,” said Sage. He says this is an important point. “We’re not setting ourselves up to compete with coal, or nuclear, or ground based solar or wind. I don’t want to pick a fight with any of those industries saying that we’re trying to take a piece of their pie. What we’re saying is that right now, from a responsible perspective in terms of being a good steward for the environment, we need to look at every single source of energy that we can get our hands on, primarily green, and develop it regardless, because we’re going to need it. SBSP is one of the few forms of energy that has the ability to be base-load, i.e., 24-7, and it’s the only form of energy that can be broadcast on demand.” The first phase of Space Energy, Inc.’s plan is to launch a small prototype satellite into low Earth orbit. “This will help validate the numbers we are speculating on at this point, but also validate several different aspects of what SBSP can do,” said Sage. “From a successful demonstration, we are hoping to close power purchase agreements with one of several entities we are in discussions with at present. And on the strength of that we should be able to put the first commercial satellite in orbit.” With regards to the timetable, Sage was hesitant to commit to a schedule. “As timetables go, everything needs to be flexible, but we are looking to close the financing for the demonstrator during the first quarter of this year (2009). The demonstrator is a 24 to 36 month project and, from there, we will start the commercial build-out of the main satellite, which could take up to four years to be operational.”

## SBSP solves energy needs

### Full solvency possible- SBSP can sustain Earth for the next 5 billion years NSS 11 (The National Space Society (NSS) is an independent, educational, non-profit organization dedicated to the creation of a spacefaring civilization. “Space Solar Power Limitless clean energy from space”, http://www.nss.org/settlement/ssp/) OP

The United States and the world need to find new sources of clean energy. Space Solar Power gathers energy from sunlight in space and transmits it wirelessly to Earth. Space solar power can solve our energy and greenhouse gas emissions problems. Not just help, not just take a step in the right direction, but solve. Space solar power can provide large quantities of energy to each and every person on Earth with very little environmental impact. The solar energy available in space is literally billions of times greater than we use today. The lifetime of the sun is an estimated 4-5 billion years, making space solar power a truly long-term energy solution. As Earth receives only one part in 2.3 billion of the Sun's output, space solar power is by far the largest potential energy source available, dwarfing all others combined. Solar energy is routinely used on nearly all spacecraft today. This technology on a larger scale, combined with already demonstrated wireless power transmission (see 2-minute video of demo), can supply nearly all the electrical needs of our planet.

### SSP solves all energy needs

NSS 07 (National Space Society, Space Solar Power Limitless clean energy from space, About Space Solar Power (SSP, also known as Space-Based Solar Power, or SBSP):, http://www.nss.org/settlement/ssp/, JG)

Advantages of Space Solar Power Unlike oil, gas, ethanol, and coal plants, space solar power does not emit greenhouse gases. Unlike coal and nuclear plants, space solar power does not compete for or depend upon increasingly scarce fresh water resources. Unlike bio-ethanol or bio-diesel, space solar power does not compete for increasingly valuable farm land or depend on natural-gas-derived fertilizer. Food can continue to be a major export instead of a fuel provider. Unlike nuclear power plants, space solar power will not produce hazardous waste, which needs to be stored and guarded for hundreds of years. Unlike terrestrial solar and wind power plants, space solar power is available 24 hours a day, 7 days a week, in huge quantities. It works regardless of cloud cover, daylight, or wind speed. Unlike nuclear power plants, space solar power does not provide easy targets for terrorists. Unlike coal and nuclear fuels, space solar power does not require environmentally problematic mining operations. Space solar power will provide true energy independence for the nations that develop it, eliminating a major source of national competition for limited Earth-based energy resources. Space solar power will not require dependence on unstable or hostile foreign oil providers to meet energy needs, enabling us to expend resources in other ways. Space solar power can be exported to virtually any place in the world, and its energy can be converted for local needs — such as manufacture of methanol for use in places like rural India where there are no electric power grids. Space solar power can also be used for desalination of sea water. Space solar power can take advantage of our current and historic investment in aerospace expertise to expand employment opportunities in solving the difficult problems of energy security and climate change. Space solar power can provide a market large enough to develop the low-cost space transportation system that is required for its deployment. This, in turn, will also bring the resources of the solar system within economic reach.

**SSP is the Best energy system for the next energy era**

**NSS 07** (National Space Society, Space Solar Power Limitless clean energy from space, About Space Solar Power (SSP, also known as Space-Based Solar Power, or SBSP):, http://www.nss.org/settlement/ssp/, JG)

The last of the candidates—solar power satellites—is the one that can best meet all of the criteria to become the energy system of the next energy era. I will review how it satisfies each criterion. Low Cost The first criterion is low cost over the long term. Usually the first reaction to the question of a solar power satellite being low cost is that nothing associated with space could possibly be low cost. That is simultaneously a correct reaction and an erroneous one. It is correct when considering the cost of hardware designed to operate in space on an independent basis with high reliability. Based on dollars per pound of space hardware versus dollars per pound of, say, a spool of copper wire, there is no comparison. But that very same piece of space hardware—a communications satellite, for example—can reduce the cost of an international telephone call by a factor of ten times less than could be provided by the spool of copper wire strung from one point on earth to another point far away. Now which one is lowest cost? The same principle applies in the case of the solar power satellite. The hardware is not cheap, but it has high productivity. The high productivity is achieved because the solar power satellite is in the sunlight over 99% of the time, which is five times more sunlight than is available at the best location on earth. It can operate at maximum capacity at all times and does not need a storage system. Its overall efficiency of converting sunlight to electricity delivered on earth is projected to be from 7% and 10%, and the system will be operating in the benign environment of space. This compares to the 1% to 3% for earth-based solar cell systems, and along with the favorable environment and the elimination of storage systems, is the fundamental reason for going to space for solar energy. If we use the cost estimates established from the preliminary designs developed by the NASA study contractors in the late 1970s, then the cost of power would be less than the cost of electricity generated by coal, oil, or nuclear power. When the initial capital costs are paid off, the cost of power could then drop to a fraction of the costs from other sources. The power costs are at least in the right ballpark. The energy is free; the only cost is the cost of the conversion hardware and the cost to maintain it. The environment in space is very favorable for most equipment. There is no wind or rain or dirt or oxygen or corrosive fluids. Things last a very long time in space. The potential exists for long-term low cost—without the inflationary cost of fossil or synthetic fuels. Nondepletable Second is the question of depletability. It is clear that the energy source is nondepletable since it is available for as long as the sun shines and, therefore, for as long as man exists. Only one part in two billionths of the sun’s energy is actually intercepted by the earth. This extremely small fraction is still a massive amount of energy. The satellites would not even have to infringe on this increment, however, as they would intercept the energy that normally streams past the earth into deep space. Geosynchronous orbit is about 165,000 miles in circumference—ample room to place as many satellites as we desire. The amount of energy that can be gathered and delivered to earth is primarily a function of how much we want, and only the usable energy is delivered to the earth. Environmentally Clean The environmental issue is what has stopped the construction of more nuclear power plants. Can solar power satellites pass this criteria? First of all, it is difficult to fault the energy source as environmentally unacceptable, even though most dermatologists try. The rest of us think having the sun around is just fine. Putting the power plant and its associated equipment 22,300 miles from the nearest house does not seem like a bad idea, either, especially when the thermal loss of energy conversion is left in deep space and will not heat up our rivers and atmosphere as all the thermal plants do. But what about the wireless energy beam? Is it a death ray that will cook us if something goes wrong and it wanders from the receiving antenna? No. Even though the radio frequency beam is the same kind of frequency as we use for cooking in our microwave ovens, the energy density (or the amount of energy in a given area) is much less than the energy density in our microwave ovens (because our ovens are designed to contain the energy and concentrate it within the oven cavity). In fact, the wireless energy beam’s maximum energy density would be less than ten times the allowed leakage from the door of a microwave oven. At that level, which would be a maximum of 50 milliwatts per square centimeter, a person would just feel some warmth if he or she was standing in the center of the beam on top of the rectenna (not a very likely event). That much energy is less than half of the energy found in bright sunlight at high noon on a Florida beach, except that it is in the form of high-frequency radio waves, or microwaves. The only definitely known reaction of living tissue to microwaves is heating. There is much debate about other possible effects, such as nervous system disorders or genetic effects due to long-term exposures at low levels. No good, hard evidence exists to prove or disprove the allegations. Many studies have been made and others are underway, however, to try to clarify the issue. In the meantime, let us consider the general evidence accumulated over the last century. X-rays and the natural radiation of radium were discovered at about the same time as radio waves. In fact, Wilhelm Rontgen discovered x-rays in 1895, which was the same year that Marconi invented the radio telegraph. As early as 1888 both Heinrich Hertz and Oliver Lodge had independently identified radio waves as belonging to the same family as light waves. The big difference between nuclear radiation and radio and light waves is that radio and light waves are non-ionizing, whereas nuclear radiation is ionizing. Unfortunately, people often confuse the two. During the ensuing years, it became very clear that the magic of x-rays and the natural radiation of radium went beyond what was originally thought. Serious side effects were soon discovered. Mysterious deaths occurred among workers who painted the luminous dials of watches. The development of the atomic bomb lead to the discovery of many more effects of excessive exposure to ionizing radiation. During that same period, radio, radar, and television grew at an even more rapid rate. Radar, television, radio, and space communication frequencies spanned the entire radio frequency range. Energy systems were added among the communication frequencies. During all these years of exposure by everyone on earth, the only nontransient effect identified has been heating. The point I am making is that if some serious phenomenon were caused by radio waves, there should be indications by now. The overall picture for the microwave environmental issue looks good, but additional data will be needed to be certain. This is the hardest data to gather—information to prove that there are no effects. The companion environmental issue is the question of the land required for the receiving antenna. Because the energy density is restricted to a very low level in the beam—in order to assure safety—the antenna must be large in order to supply the billion watts of power from a solar power satellite. The antenna would be about 1.8 miles wide. Since it can be elevated above the ground and since it would block less that 20% of the sunlight while stopping over 99% of the microwaves, the land can be used for agriculture as well as for the receiving antenna. In comparison, the total land required is less than with most other energy systems. The amount of land required for the receiving antenna is actually much less than that required for coal strip mines to produce an equivalent amount of power over 40 years. Available to Everyone The satellites may be located at any location around the earth and would be able to beam their energy to any selected receiver site except near the North and South Poles. Certainly they could make electricity available to all the larger populated areas of the earth, if those areas purchased a satellite or bought the electricity from a utility company that owned one. It is not possible for most countries to be able to afford the development costs of a satellite system, but once developed the cost of individual satellites would be within the capability of many countries. In a Useful Form With solar power satellites, the form of the energy delivered is electricity, the cleanest and highest form available to us. It is the form we need to clean up the earth’s environment. It is the energy form of the future. Here at last is a nondepletable, clean energy source with vast capacity, within our capability to develop, waiting to carry us into the twenty-first century.

### US SSP Development Good – Control Energy Future

SHSG 11 (Solar High Study Group, Solar High: Energy for the 21st Century, The Solar Solution, http://solarhigh.org/resources/16KwordBrief.pdf, JG)

The expected cost of deploying SBSP is ~$7,400/kW, including the rectenna as well as construction and launch of Block II satellites. Amortized over an expected life of 30 years at a discount rate of 5%, the contribution of this capital cost to the delivered cost of electric energy would be 5.6 cents/kWh. SBSP is thus much more promising than terrestrial solar as a replacement for fossil fuels or nuclear power. A strong US commitment to SBSP could  Solve the energy problem permanently, in the USA and around the world.  Offer clean, inexhaustible solar power almost anywhere on Earth.  Restore the status of the United States as an energy-exporting nation.  Create large international markets for export of our technology as well as energy.  Offer greatly reduced launch costs to all users of space, including the DoD, NASA and commercial interests.  Restore US preeminence in launch services.  Permit explosive growth in extraterrestrial enterprises.  Open the solar system as the domain of our species, eliminating most concerns about resource exhaustion. Serious studies of SBSP are under way in several countries, including Japan, China, India and the European Union. **Continued US neglect of this vital technology means that we will not only suffer all the economic, political and strategic consequences of abdicating our leadership in space but also abandon control of our energy future.** What we do about these issues in the next few years will determine whether we will restore American initiative or become a debt-ridden, second-rate nation that must import electricity as well as petroleum. There are three important roles for government agencies in making SBSP happen:  NASA and ARPA-E should be working on advanced enabling technologies that can make SBSP even more effective, as NACA once did for aviation. Examples include improvements to reusable, economical rocket engines, reentry systems, gossamer space structures, and lightweight, efficient microwave transmitters.  NASA, NOAA and the DoD should offer performance-based contracts in advance for a sufficient number of commercial launches to justify private development of suitable reusable vehicles. This will save money, compared to continued reliance on expendable launch vehicles. This policy is analogous to the use of airmail contracts in promoting the airline industry.  The Congress should reduce risks for large private investments in power satellites by offering loan guarantees, tax holidays and other incentives. Note that these functions do not include large upfront Federal expenditures on system studies or power satellite development programs.

## Space better than Ground

### SBSP more effective than GBSP

SHSG 11 (Solar High Study Group, Solar High: Energy for the 21st Century, The Solar Solution, http://solarhigh.org/resources/16KwordBrief.pdf, JG)

If we want to make solar energy affordable, we must put the collectors in space, where the sun shines 24/7 and the intensity of sunlight is 1,360 W/sq.m., 40% greater than on Earth. The best location is geostationary orbit (GSO, 35,800 km above the equator), where a satellite remains fixed relative to terrestrial sites. The principal components of a power satellite are a large solar array and a microwave transmitter that beams power to an Earth-based receiver called a rectenna (a contraction of ‘rectifying antenna’), where it is converted to standard AC. The continuous, intense sunlight in GSO means that that no energy storage is needed, and that the solar array is a factor of 8 smaller than a similar terrestrial array with the same average output. The benign operating environment, in vacuum and free fall, permits high solar concentration without complex sun-tracking mechanisms and avoids maintenance problems caused by wind, dust, rain, snow or hail. Each satellite will deliver 2 GW to the utility grid, an output similar to a large nuclear plant. There is room in GSO for thousands of them. The microwave flux in the power beam is insufficient to harm aircraft or birds. The rectenna area is a factor of 9 smaller than the terrestrial solar farm that it replaces; it can be located close to the intended load center; and the structure shields the ground underneath from microwaves but is largely transparent to sunlight, so that it can be used for agriculture or other purposes. The technical feasibility of space-based solar power (SBSP) is beyond dispute. PV cells have been used in space for decades, and wireless power transmission has been demonstrated repeatedly, on Earth and in space. NASA and the DOE sponsored an extensive study of the subject in the late 1970s that found no show-stoppers, and this result has been confirmed by several major studies since then. We have been waiting for advances in space technology to reduce costs to a competitive level. That time is now.

### Earth Solar Power is weak, can’t be stored, and only works during the day

Lemonick 09 (Michael, senior writer at Climate Central, Yale Environment 360, Solar Power from Space: Moving Beyond Science Fiction, http://e360.yale.edu/content/feature.msp?id=2184, JG)

Despite the enormous promise of solar power, the drawbacks of the technology remain significant. People need electricity every day, around the clock, but there’s no part of the United States that is cloud-free 365 days a year — and no solar radiation at night. You have to find some way to store the energy for those sunless periods, and there’s not yet a large-scale way to do that. Moreover, the best locations for solar arrays — the deserts of the American Southwest — are far from the centers of population, so even under the best of circumstances you’d have to send electricity many hundreds of miles through transmission lines that don’t yet exist.

## Better than other renewables

### SBSP is feasible and uniquely better than other alternatives to fossil fuels

Bonnici 9 (Alex Michael Bonnici Ph.D, Presenter and European Union Liason for the NSS, “Solar Power Satellites: The Yes Case”, http://www.discovery-enterprise.com/2009/01/solar-power-satellites-yes-case.html, 1/20/09) SV

And, neither nuclear energy (either fission or fusion) will prove to be a viable alternative. Here are some of the problems presented by the use of nuclear fission energy production (a technology that has been with us for more than sixty years): nuclear proliferation -- not a problem with SPS disposal and storage of radioactive waste -- not a problem with SPS preventing fissile material from being obtained by terrorists or their sponsors -- not a problem with SPS public perception of danger -- problem with both SPS and nuclear power consequences of major accident, e.g., Chernobyl -- effectively zero with SPS, save on launch (during construction or for maintenance) military and police cost of protecting the public and loss of democratic freedoms -- control of SPS would be a power/influence center, perhaps sufficient to translate into political power. However, this has not yet happened in the developed world with nuclear power. installation delays. These have been notoriously long with nuclear power plants (at least in the US), and may be reduced with SPS. With sufficient commitment from SPS backers, the difference may be substantial. On balance, SPS avoids nearly all of the problems with current nuclear power schemes, and does not have larger problems in any respect, although public perception of microwave power transfer (ie, in the beams produced by an SPS and received on Earth) dangers could become an issue. Energy via nuclear fusion also has its share of problems. It is still a technology yet to be realised. Despite more than fifty years or research effort we have yet to achieve a controlled nuclear fusion reaction that yields more energy than went into producing the reaction in the first place. Nuclear fusion is a process used in stars, thermonuclear bombs (e.g., the H-bomb), and in a very small way some laboratory experiments. Projected nuclear fusion power plants would not be explosive, and will likely be inherently failsafe as the conditions for fusion on Earth are extremely hard to maintain and the reaction will promptly stop if any of them is changed (eg, via component or control system maladjustment or failure). However, sustained nuclear fusion generators have only just been demonstrated experimentally, despite extensive research over a period of several decades (since approximately 1952). There is still no credible estimate of how long it will be before a nuclear fusion reactor could become commercially possible; fusion research continues on a significant scale, including an internationally supported large scale project -- the ITER facility currently under construction has been funded at about €10 billion[60]. There has been much criticism of the value of continued funding of fusion research given the continued failure to produce even small amount of net power in any of the varied attempted schemes.[61]. Nevertheless, proponents have successfully argued in favor of ITER funding. In our quest to achieve controlled nuclear fusion on earth (a pursuit I still think is worthy of more research and funding) we must not overlook that we have a ready source of clean plentiful nuclear fusion energy shinning overhead in our skies. The technology to utilise this vast source of energy demands no major breakthroughs in physics or engineering and is already in our grasp. And, we have been using solar power in space for decades almost since the dawn of the space age. In contrast, SPS does not require any fundamental engineering breakthroughs, has already been extensively reviewed from an engineering feasibility perspective over some decades, and needs only incremental improvements of existing technology to be deployable. Despite these advantages, SPS has received minimal research funding to date in comparison.

### SBSP is the only solution to energy needs

**Snead 9** (James M. Snead, senior member of the American Institute of Aeronautics and Astronautics and president of the Spacefaring Institute LLC, “The Vital Need for America to Develop Space Solar Power”, http://www.thespacereview.com/article/1364/1, 5/4/2009)

A key element of a well-reasoned US energy policy is to maintain an adequate surplus of dispatchable electrical power generation capacity. Intelligent control of consumer electrical power use to moderate peak demand and improved transmission and distribution systems to more broadly share sustainable generation capacity will certainly help, but 250 million additional Americans and 5 billion additional electrical power consumers worldwide by 2100 will need substantially more assured generation capacity. Three possible energy sources that could achieve sufficient generation capacity to close the 2100 shortfall are methane hydrates, advanced nuclear energy, and SSP. The key planning consideration is: Which of these are now able to enter engineering development and be integrated into an actionable sustainable energy transition plan? Methane hydrate is a combination of methane and water ice where a methane molecule is trapped within water ice crystals. The unique conditions necessary for forming these hydrates exist at the low temperatures and elevated pressures under water, under permafrost, and under cold rock formations. Some experts estimate that the undersea methane hydrate resources are immense and may be able to meet world energy needs for a century or more. Why not plan to use methane hydrates? The issues are the technical feasibility of recovering methane at industrial-scale levels (tens to hundreds of billions BOE per year) and doing so with acceptable environmental impact. While research into practical industrial-scale levels of recovery with acceptable environmental impact is underway, acceptable production solutions have not yet emerged. As a result, a rational US energy plan cannot yet include methane hydrates as a solution ready to be implemented to avoid future energy scarcity. Most people would agree that an advanced nuclear generator scalable from tens of megawatts to a few gigawatts, with acceptable environmental impact and adequate security, is a desirable long-term sustainable energy solution. Whether this will be an improved form of enriched uranium nuclear fission; a different fission fuel cycle, such as thorium; or, the more advanced fusion energy is not yet known. Research into all of these options is proceeding with significant research advancements being achieved. However, until commercialized reactor designs are demonstrated and any environmental and security issues associated with their fueling, operation, and waste disposal are technically and politically resolved, a rational US energy plan cannot yet include advanced nuclear energy as a solution ready to be implemented to avoid future energy scarcity. We are left with SSP. Unless the US federal government is willing to forego addressing the very real possibility of energy scarcity in dispatchable electrical power generation, **SSP is the one renewable energy solution** capable of beginning engineering development and, as such, being incorporated into such a rational sustainable energy transition plan. Hence, beginning the engineering development of SSP now becomes a necessity.

### SBSP better than other renewables and solves ground-based solar intermittency problems

Barrett 09 (Scott, PhD Economics Oxford, The Coming Global Climate–Technology Revolution, Solar Power, pdf, proquest, JG)

A more radical idea is “space solar power.” This technology would use huge photovoltaic arrays to capture the sun’s energy in space, convert it to direct electrical current, and then beam the electricity to Earth using microwaves or lasers. To produce this energy, solar satellites would be placed in high altitude, geosynchronous orbit, and spaced far enough apart so that at least one unit faced the sun at all times—a solution to the intermittency problem. Macauley and Shih (2007) calculate that, as compared with alternatives such as combined cycle gas turbines and wind, space solar power could be competitive in meeting incremental electricity demand by 2030 in places like California, the U.S. Midwest, Germany, and India—provided fossil fuel alternatives faced a carbon penalty of about $15–25/tCO2.2 This estimate makes space solar power look very appealing, but it may be optimistic—among other things, the economics of space solar power depend on enhancements in complementary technologies, such as those that can reduce Earth-to-orbit transportation costs.

### SBSP better than other alternatives- 4 reasons

Snead 09 (James M, The Space Review, The Vital Need For America to Develop Space Solar Power, http://www.thespacereview.com/article/1364/1, JG)

Interest in SSP has reemerged in response to the public’s growing appreciation of the need to develop new sustainable energy sources. Compared to other terrestrial renewable alternatives, GEO SSP has four important advantages: Its scale of potential generation capacity is very large, an important consideration in formulating policies and plans to avoid future energy scarcity. It should have the ability to provide high quality electrical power—nearly 365 days of the year, 24 hours a day—for baseload electrical power supply comparable to nuclear energy. It should have nearly worldwide access and usability enabling countries to achieve a degree of energy independence even when traditional renewable energy sources are not practical. It should have important terrestrial environmental benefits, including avoiding thermal waste heat ejection and minimizing the land area otherwise needed for terrestrial renewable energy generation.

### SSP is the Best energy system for the next energy era

NSS 07 (National Space Society, Space Solar Power Limitless clean energy from space, About Space Solar Power (SSP, also known as Space-Based Solar Power, or SBSP):, http://www.nss.org/settlement/ssp/, JG)

The last of the candidates—solar power satellites—is the one that can best meet all of the criteria to become the energy system of the next energy era. I will review how it satisfies each criterion. Low Cost The first criterion is low cost over the long term. Usually the first reaction to the question of a solar power satellite being low cost is that nothing associated with space could possibly be low cost. That is simultaneously a correct reaction and an erroneous one. It is correct when considering the cost of hardware designed to operate in space on an independent basis with high reliability. Based on dollars per pound of space hardware versus dollars per pound of, say, a spool of copper wire, there is no comparison. But that very same piece of space hardware—a communications satellite, for example—can reduce the cost of an international telephone call by a factor of ten times less than could be provided by the spool of copper wire strung from one point on earth to another point far away. Now which one is lowest cost? The same principle applies in the case of the solar power satellite. The hardware is not cheap, but it has high productivity. The high productivity is achieved because the solar power satellite is in the sunlight over 99% of the time, which is five times more sunlight than is available at the best location on earth. It can operate at maximum capacity at all times and does not need a storage system. Its overall efficiency of converting sunlight to electricity delivered on earth is projected to be from 7% and 10%, and the system will be operating in the benign environment of space. This compares to the 1% to 3% for earth-based solar cell systems, and along with the favorable environment and the elimination of storage systems, is the fundamental reason for going to space for solar energy. If we use the cost estimates established from the preliminary designs developed by the NASA study contractors in the late 1970s, then the cost of power would be less than the cost of electricity generated by coal, oil, or nuclear power. When the initial capital costs are paid off, the cost of power could then drop to a fraction of the costs from other sources. The power costs are at least in the right ballpark. The energy is free; the only cost is the cost of the conversion hardware and the cost to maintain it. The environment in space is very favorable for most equipment. There is no wind or rain or dirt or oxygen or corrosive fluids. Things last a very long time in space. The potential exists for long-term low cost—without the inflationary cost of fossil or synthetic fuels. Nondepletable Second is the question of depletability. It is clear that the energy source is nondepletable since it is available for as long as the sun shines and, therefore, for as long as man exists. Only one part in two billionths of the sun’s energy is actually intercepted by the earth. This extremely small fraction is still a massive amount of energy. The satellites would not even have to infringe on this increment, however, as they would intercept the energy that normally streams past the earth into deep space. Geosynchronous orbit is about 165,000 miles in circumference—ample room to place as many satellites as we desire. The amount of energy that can be gathered and delivered to earth is primarily a function of how much we want, and only the usable energy is delivered to the earth. Environmentally Clean The environmental issue is what has stopped the construction of more nuclear power plants. Can solar power satellites pass this criteria? First of all, it is difficult to fault the energy source as environmentally unacceptable, even though most dermatologists try. The rest of us think having the sun around is just fine. Putting the power plant and its associated equipment 22,300 miles from the nearest house does not seem like a bad idea, either, especially when the thermal loss of energy conversion is left in deep space and will not heat up our rivers and atmosphere as all the thermal plants do. But what about the wireless energy beam? Is it a death ray that will cook us if something goes wrong and it wanders from the receiving antenna? No. Even though the radio frequency beam is the same kind of frequency as we use for cooking in our microwave ovens, the energy density (or the amount of energy in a given area) is much less than the energy density in our microwave ovens (because our ovens are designed to contain the energy and concentrate it within the oven cavity). In fact, the wireless energy beam’s maximum energy density would be less than ten times the allowed leakage from the door of a microwave oven. At that level, which would be a maximum of 50 milliwatts per square centimeter, a person would just feel some warmth if he or she was standing in the center of the beam on top of the rectenna (not a very likely event). That much energy is less than half of the energy found in bright sunlight at high noon on a Florida beach, except that it is in the form of high-frequency radio waves, or microwaves. The only definitely known reaction of living tissue to microwaves is heating. There is much debate about other possible effects, such as nervous system disorders or genetic effects due to long-term exposures at low levels. No good, hard evidence exists to prove or disprove the allegations. Many studies have been made and others are underway, however, to try to clarify the issue. In the meantime, let us consider the general evidence accumulated over the last century. X-rays and the natural radiation of radium were discovered at about the same time as radio waves. In fact, Wilhelm Rontgen discovered x-rays in 1895, which was the same year that Marconi invented the radio telegraph. As early as 1888 both Heinrich Hertz and Oliver Lodge had independently identified radio waves as belonging to the same family as light waves. The big difference between nuclear radiation and radio and light waves is that radio and light waves are non-ionizing, whereas nuclear radiation is ionizing. Unfortunately, people often confuse the two. During the ensuing years, it became very clear that the magic of x-rays and the natural radiation of radium went beyond what was originally thought. Serious side effects were soon discovered. Mysterious deaths occurred among workers who painted the luminous dials of watches. The development of the atomic bomb lead to the discovery of many more effects of excessive exposure to ionizing radiation. During that same period, radio, radar, and television grew at an even more rapid rate. Radar, television, radio, and space communication frequencies spanned the entire radio frequency range. Energy systems were added among the communication frequencies. During all these years of exposure by everyone on earth, the only nontransient effect identified has been heating. The point I am making is that if some serious phenomenon were caused by radio waves, there should be indications by now. The overall picture for the microwave environmental issue looks good, but additional data will be needed to be certain. This is the hardest data to gather—information to prove that there are no effects. The companion environmental issue is the question of the land required for the receiving antenna. Because the energy density is restricted to a very low level in the beam—in order to assure safety—the antenna must be large in order to supply the billion watts of power from a solar power satellite. The antenna would be about 1.8 miles wide. Since it can be elevated above the ground and since it would block less that 20% of the sunlight while stopping over 99% of the microwaves, the land can be used for agriculture as well as for the receiving antenna. In comparison, the total land required is less than with most other energy systems. The amount of land required for the receiving antenna is actually much less than that required for coal strip mines to produce an equivalent amount of power over 40 years. Available to Everyone The satellites may be located at any location around the earth and would be able to beam their energy to any selected receiver site except near the North and South Poles. Certainly they could make electricity available to all the larger populated areas of the earth, if those areas purchased a satellite or bought the electricity from a utility company that owned one. It is not possible for most countries to be able to afford the development costs of a satellite system, but once developed the cost of individual satellites would be within the capability of many countries. In a Useful Form With solar power satellites, the form of the energy delivered is electricity, the cleanest and highest form available to us. It is the form we need to clean up the earth’s environment. It is the energy form of the future. Here at last is a nondepletable, clean energy source with vast capacity, within our capability to develop, waiting to carry us into the twenty-first century.

## AT: Nuke Power Solves

### **Space solar power solves better – cost-effective and safer - our evidence is comparative**

Kelley, ’11 - Freelance science writer, citing Dr. Feng Hsu, lead engineer in Frontier Space Missions at NASA GSFC [Mike, “Chinese solar power expert makes case for space-based solar power,” http://www.al.com/42/index.ssf/2011/05/chinese\_solar\_power\_expert\_mak.html, DS]

The U.S. and the world should take a serious look at solar power as an alternative to nuclear power, Dr. Feng Hsu told a group Thursday at the International Space Development Conference in Huntsville. "Humanity is at a crossroads, with energy the driving factor in human economics," the Chinese solar power researcher said. "Nuclear energy has played an important role for the past 50 years, but we must look seriously at the its problems and limitations," he said. His presentation, "Space Based Solar Power as a Safe and Sustainable Alternative to Nuclear Energy," stated that nuclear power has been much costlier than envisioned 50years ago, when the first U.S. nuclear power plants were built. The U.S. has spent more than $492 billion on nuclear power, he said, which surpasses the combined costs of the Vietnam War and the Apollo/Saturn program. Hsu pointed to the recent Fukushima nuclear power plant explosions in Japan and the 1986 Chernobyl meltdown in the Ukraine as evidence of what he termed the dangers of nuclear power. Nearly 1 million have died, he said, in the 25 years since the disaster, and most of the deaths have occurred more than 30 miles from the now-abandoned nuclear facility. In addition, he sees danger in rogue nations of the world getting access to nuclear power, a situation that can't be prevented. "There's no way we can prevent this from happening. It's just a matter of time," he said. It currently costs $3 billion to $5 billion to design and build a new nuclear plant, and it would take 8,000 such plants to replace the world's coal-fired plants, he added. Solar Power is the logical alternative, Hsu said, and he foresees solar power becoming much cheaper with ongoing advances in solar cell technology. China has made major advances in solar panel efficiency, with more to come. He called for more federal spending on research and development of solar power technology, which he feels is essential if solar power it to take off as a viable U.S. power source. "Today, it would take an array of solar panels the area of Vermont to power the U.S. But in just four or five years, that array could be much smaller."

### Avoids disads of nuclear power – no meltdowns or disasters

Vaidyanathan 6/26 - Writer at Outlook Magazine [Lalitha, “Power from Space to Tackle Fukushima-like Incidents,” Outlook, http://news.outlookindia.com/item.aspx?725954, DS]

With many world governments rejecting the few kinds of base load electrical power that is currently available in wake of the Fukushima accident and climate change, is it possible to re-examine the Space-based Solar Power (SSP) concept as an emergency power supply to a situation comparable to the one witnessed in Japan this year? The answer is "yes", according to space scientists who have been working on Space solar power for last two decades. Baseload power plants (using non-renewable fuels like nuclear and coal) typically run at all times through the year except in the case of scheduled maintenance or repairs and produce energy at a constant rate, usually at a low cost. Space Solar Power is a system of placing very large arrays of light solar panels in high Earth orbit, (in space) where sunlight is, "five to seven times as strong as solar power on the earth's surface and available 24 hours a day, seven days a week," said the founder of America's Space Development Steering Committee Howard Bloom. "Any equipment placed in space is totally immune to fires, earthquakes, floods, volcanoes, tsunamis, hurricanes, tornadoes, local wars and other forms of destruction on the ground," John K Strickland, who specialises in issues relating to access to space, planetary bases, space solar power and environment and is a member of the Board of Directors of the National Space Society (NSS) in the US told PTI. The power generated from sunlight in space can be converted to a wide beam of microwaves or a tight beam of laser light and sent down to the ground very efficiently. "The idea arose at one of our Space Development Steering Committee meeting recently, partly as a response to thinking about how the Japanese nuclear accident could have been prevented just by making emergency power available from space in a few hours," Strickland and Bloom said. Since no one has died as a result of Fukushima accident, the power is just as (or even more) valuable at any disaster scene where people are dying as a result of no power, Strickland said. Power at the nuclear plant at Fukushima was knocked out by tsunami, causing damage to power lines and the backup diesel generators, while the pumps themselves were apparently not damaged initially. All they needed was a source of electricity which could have come from SSP, he said. The equipment (about 5-20 tonnes), to provide about one Megawatt (or more) of power from such a laser power beam can be quickly moved to the site of an emergency or disaster, by a large helicopter in a single trip. The exact weight and volume of the solar panels would need to be determined by engineers, Strickland said. The emergency receiver equipment, consisting of thin sheets of solar panels, would be brought in from outside the disaster area, where it would be stored in a safe location. The idea is intended to provide emergency power to any disaster site or sites on Earth, and would only take three satellites to implement, he said. "A single satellite would cover most of Asia and I would assume that is where the first satellite would be placed. All that is needed at the site is a flat rooftop or area of ground about 50-100 feet wide to arrange the set of solar panels flat on the surface. The satellite, in the same orbit used by your TV signal satellite, would aim a laser beam also about 50-100 feet wide from 22,000 miles high down to the emergency site," he said. The beam would not be high power and therefore, could not be used as a weapon, Strickland said. At the same power level as the Sun at noon, the laser beam could provide as much as 300-400 watts per square metre of actual power, so 600 solar panels of four sq m each would provide about one MW of power. The panels would be light and could be stacked closed together on pallets. With the currently available technology, the power could be made available for 24 hours, seven days a week and could be delivered and set up in as little as six hours, depending on regional pre-positioning of equipment and organisational readiness, Strickland said. The system would be relatively automatic and would not require highly trained personnel to operate, he said. A larger array of such panels could have provided power to pumps at the Japanese nuclear site where almost all of the problems were caused by a lack of electricity, power needed just to pump water, ironically at a power generating plant, he added. "Since all the equipment would be brought to the site and set up after the disaster, it would be undamaged and ready to provide power," Strickland said. SSP is ultimately intended to provide a very large alternate supply of base load power to the whole Earth, but current very high launch costs have prevented using this system, Strickland said. "We believe that using a few specialised emergency satellites would provide a significant benefit to the Earth – covering emergencies - where power can save lives and property," he said. Only about three such satellites would be needed for the entire earth, two for Europe and Asia and one for the Americas, he said. "We believe that it will be possible to build and launch such as set of satellites within a decade using a new generation of cheaper rockets now being built," Strickland said adding that emergency power is much more valuable than base load power, so the launch costs would be affordable for the service provided. For example, a set of three 50 Megawatt satellites would be able to provide one megawatt of emergency power to 150 sites worldwide simultaneously. Alternately, 10 megawatts each could be provided to 15 sites, such as five in the Americas, five in Europe and five in Asia. The cost of building and launching these three satellites would be vastly cheaper than the damage and cleanup required after an accident similar to the current one, Strickland said. This project could also advance the science and development of space solar concept and allow it to be used as a replacement power source and an addition to other energy systems sooner than expected, he said. When asked whether military programme on the solar power will have some implementing problem affecting such a civil programme, Strickland said the US military has no lock on any technology unless it is a "black program" or unless they funded it. "This space solar emergency power supply is not 'black' by any means. Everything was openly published on the space solar base supply concept in 2007. I know of no secret programs to build such a system," he said. Currently there are no funded programmes supporting Space Solar by any US agency to our knowledge, he said. "Solar power in space is close to infinite," says Bloom, adding "the sooner we begin to tap it, the better off the world will be. And using space solar power for emergencies is an excellent start."

### Nuclear power isn’t inevitable – Japan’s led to global backlash

Scheer and Moss 6/24 - Environmental writers at Scientific American [Roddy and Doug, 6/24/2011, Scientific American, “As the World Reconsiders Nuclear Energy, the U.S. Remains Committed to Its Expansion,” http://www.scientificamerican.com/article.cfm?id=re-thinking-nuclear-energy. DS]

In the wake of the Fukushima disaster in Japan, countries around the world that were growing more bullish on nuclear power are now reconsidering their future energy investments. Germany has shut down seven of its oldest nuclear reactors and is conducting safety studies on the remaining facilities; those that don’t make the grade could be closed permanently. Meanwhile, in earthquake-prone Chile some 2,000 demonstrators marched through the capital to protest their government’s enthusiasm for nuclear power. And China, the world’s fastest growing nuclear energy developer, has suspended the approval process on 50 nuclear power plants already on the drawing board, and begun inspections on 13 existing plants.

### Nuclear power’s too expensive – can’t solve and just hurts the economy

Trounson, ‘6 – writer at The Australian [Andrew, 5/31/2006, The Australian, Lexis, DS]

Energy THE nuclear debate will remain purely academic for decades in the absence of any commitment by government to putting a cost on carbon emissions, according to the electricity industry. While industry planning has moved to include nuclear power as an option for the first time, in the event of a carbon tax or emissions trading, at twice the installed cost of coal or gas generation it remains too expensive. ''If there is no constraint on building coal and gas power generation, nuclear still isn't competitive, even by 2030,'' said John Boshier, chief executive of the National Generators Forum, whose members account for 90 per cent of Australia's electricity market. Even with a ''serious'' government policy on restricting or penalising emissions, the power industry would not expect nuclear power to be in the frame until 2020 at the earliest, Mr Boshier said. ''No forum member company has any plans too build nuclear power. There isn't even any active investigation going on,'' Mr Boshier said. While Prime Minister John Howard is pushing for a fresh assessment of the potential for a nuclear industry in Australia, and while nuclear power is being discussed more in the corridors of utilities, industry insiders say it remains largely a theoretical issue. According to a power industry insider, at least one board of a government utility is believed to have had a briefing on nuclear power, but dismissed it as too expensive. ''You aren't going to do engineering studies on a what if,'' said the insider. ''At the moment it is just a conversation.'' But with nuclear power being increasingly touted as an answer to cutting greenhouse gas emissions, the forum has plugged it into its new scenario modelling, the results of which are expected to be available from the end of July. ''We are examining the impacts of low emission targets on us -- what the industry would look like -- and we are including nuclear power as one of the options,'' Mr Boshier said. But at twice the installation cost of coal and gas-fired generation, nuclear faced a major hurdle in becoming economic, Mr Boshier said. The Generators Forum has estimated the installed cost of nuclear power, in real terms, in 2010 at $US2000/kilowatt, compared with $US1000/kw for coal and combined cycle gas turbines. By 2020 the real cost falls to $US1700/kw but is still higher than the real cost of coal-fired generation, which even after including the cost of carbon capture technology and underground sequestration techniques comes in at $US1300/kw. By 2030 installed nuclear costs fall to $US1500/kw, compared with $US1200 for coal combined with carbon capture and sequestration. So far, the federal Government has ruled out imposing a carbon tax or emissions trading. But the states and territories are working on proposals to bypass the federal Government and introduce emissions trading.

### Limited resources force a tradeoff – and cost and threats make nuke power comparatively worse

Kohler, ‘9 - Director of Wisconsin Environment, nonprofit environmental research group – [Dan, 12/23/2009, The Cap Times, “Dan Kohler: Nuclear power can't solve global warming,” http://host.madison.com/ct/news/opinion/column/article\_888970d5-23cd-54f7-b325-a71162cc891a.html#ixzz1SIWsiZ26, DS]

The damaging impacts of climate change -- from the acidification of the world’s oceans to melting glaciers and rising sea levels -- are happening even faster than the most eye-opening predictions made by the U.N. Intergovernmental Panel on Climate Change just two years ago. However, with immediate, swift and decisive action at all levels of government -- local to international -- we still have a chance to avoid many of the most catastrophic impacts of global warming. Given the scale of the threat, we should put every possible solution on the table, except for the status quo. We should carefully consider all sources of carbon-free energy -- even nuclear power -- to make sure that we choose the approach most likely to deliver success. On the surface, the case for nuclear power looks reasonable. Nuclear power is capable of producing large amounts of electricity while emitting little to none of the heat-trapping gases that cause global warming. However, in a recent study, Wisconsin Environment found that far from being a solution to global warming, nuclear power would actually set us back in the fight to solve it. To avoid the most catastrophic impacts of global warming, America must cut power plant emissions roughly in half over the next 10 years. Since no new reactors are now under construction in the U.S. and building a single reactor could take 10 years or longer, it is quite possible that nuclear power could deliver no progress in the critical next decade. Even if the nuclear industry somehow managed to build 100 nuclear reactors by 2030, nuclear power would reduce U.S. emissions of global warming pollution over the next 20 years by only 12 percent -- far too little and too late. Fortunately, in contrast to nuclear power, energy efficiency and clean, renewable energy such as wind, solar and biomass can provide immediate and affordable solutions. Combined with enhancements to our electricity grid, these technologies can also make our energy supply more reliable. Energy efficiency programs are already cutting electricity consumption by 1 percent to 2 percent annually in leading states. The U.S. wind industry is already building the equivalent of three nuclear reactors per year. And America has vast potential to do more. One might ask: Shouldn’t we use clean energy and nuclear power to address the problem? In a world of unlimited resources, such a plan would be conceivable. But in the real world of limited resources **we need to make choices**. In this context, we must recognize that investing in new nuclear reactors would actually delay needed progress and divert critical investment dollars away from better solutions. In addition, there are still the unresolved problems of how to safely dispose of nuclear waste, the environmental impacts of mining and processing uranium, the risk of nuclear weapons proliferation, and the potential consequences of an accident or terrorist attack at a nuclear power plant. The bottom line: We can spend $600 billion on nuclear power and fail to solve global warming. Or we can spend the same money on clean energy and achieve twice the carbon reductions at a much faster pace. When you factor in ongoing operation costs, clean energy will deliver five times more pollution reduction than nuclear power. To address global warming, state and federal policymakers should focus on improving energy efficiency and generating electricity from clean sources that never run out such as wind, solar, biomass and geothermal power.

## Nuke Power Bad

### Nuclear power makes meltdowns frequent

Coplan, 6 - Associate Professor of Law, Pace University School of Law

(Karl S, “THE INTERCIVILIZATIONAL INEQUITIES OF NUCLEAR POWER WEIGHED AGAINST THE

INTERGENERATIONAL INEQUITIES OF CARBON BASED ENERGY,” 17 Fordham Envtl. Law Rev. 227,

Symposium, :Lexis, 2006)

Every operating nuclear power plant poses some risk of a severe accident, including an uncontrolled nuclear reaction that leads to core meltdown and potentially huge releases of radioactivity into the environment. The nuclear industry estimates the chances of a severe reactor accident to be about one out of every 10,000 reactor years of operation. 98 While this may sound like a small risk, it means that with 100 operating nuclear power plants in the United States, we can expect one severe accident every 100 years. If these 100 plants keep operating indefinitely into the future, or are replaced in kind to mitigate global carbon emissions, a severe reactor accident is **virtually certain** in this country in the future. Moreover, if we were to construct the 200 additional nuclear power plants in this country necessary to meet the Phase I carbon [\*244] reductions contemplated by the Kyoto Protocol, 99 that same one-in-ten thousand chance of a severe reactor accident would turn into an expectation of one severe reactor accident every thirty years. Combined with all the other nuclear reactors around the world - and assuming that all such reactors are at least as safe and well operated as those in the United States - **severe nuclear reactor accidents would be expected to occur ever few years**.

### **Extinction**

Wasserman, 2001 - Senior Editor – Free Press [Harvey, “America's Terrorist Nuclear Threat to Itself”, October, http://www.wagingpeace.org/articles/2001/10/00\_wasserman\_nuclear-threat.htm]

Then comes the abominable wave of cancers, leukemias, lymphomas, tumors and hellish diseases for which new names will have to be invented, and new dimensions of agony will beg description. Indeed, those who survived the initial wave of radiation would envy those who did not. Evacuation would be impossible, but thousands would die trying. Bridges and highways would become killing fields for those attempting to escape to destinations that would soon enough become equally deadly as the winds shifted. Attempts to quench the fires would be futile. At Chernobyl, pilots flying helicopters that dropped boron on the fiery core died in droves. At Indian Point, such missions would be a sure ticket to death. Their utility would be doubtful as the molten cores rage uncontrolled for days, weeks and years, spewing ever more devastation into the eco-sphere. More than 800,000 Soviet draftees were forced through Chernobyl's seething remains in a futile attempt to clean it up. They are dying in droves. Who would now volunteer for such an American task force? The radioactive cloud from Chernobyl blanketed the vast Ukraine and Belarus landscape, then carried over Europe and into the jetstream, surging through the west coast of the United States within ten days, carrying across our northern tier, circling the globe, then coming back again. The radioactive clouds from Indian Point would enshroud New York, New Jersey, New England, and carry deep into the Atlantic and up into Canada and across to Europe and around the globe again and again.The immediate damage would render thousands of the world's most populous and expensive square miles permanently uninhabitable. All five boroughs of New York City would be an apocalyptic wasteland. The World Trade Center would be rendered as unusable and even more lethal by a jet crash at Indian Point than it was by the direct hits of 9/11. All real estate and economic value would be poisonously radioactive throughout the entire region. Irreplaceable trillions in human capital would be forever lost. As at Three Mile Island, where thousands of farm and wild animals died in heaps, and as at Chernobyl, where soil, water and plant life have been hopelessly irradiated, natural eco-systems on which human and all other life depends would be permanently and irrevocably destroyed, Spiritually, psychologically, financially, ecologically, our nation would never recover. This is what we missed by a mere forty miles near New York City on September 11. Now that we are at war, this is what could be happening as you read this. There are 103 of these potential Bombs of the Apocalypse now operating in the United States. They generate just 18% of America's electricity, just 8% of our total energy. As with reactors elsewhere, the two at Indian Point have both been off-line for long periods of time with no appreciable impact on life in New York. Already an extremely expensive source of electricity, the cost of attempting to defend these reactors will put nuclear energy even further off the competitive scale. Since its deregulation crisis, California---already the nation's second-most efficient state---cut further into its electric consumption by some 15%. Within a year the US could cheaply replace virtually with increased efficiency all the reactors now so much more expensive to operate and protect. Yet, as the bombs fall and the terror escalates, Congress is fast-tracking a form of legal immunity to protect the operators of reactors like Indian Point from liability in case of a meltdown or terrorist attack. Why is our nation handing its proclaimed enemies the weapons of our own mass destruction, and then shielding from liability the companies that insist on continuing to operate them? Do we take this war seriously? Are we committed to the survival of our nation? If so, the ticking reactor bombs that could obliterate the very core of our life and of all future generations must be shut down.

### Nuclear power’s bad – plants are aging and leaking waste

Kindt 7/14 – University of Illinois business and legal policy professor, environmental law expert [John W., 7/14/2011, Illinois Times, “How safe is US nuclear power?,” http://www.illinoistimes.com/Springfield/article-8875-how-safe-is-us-nuclear-power.html, DS]

The head of the U.S. Nuclear Regulatory Commission recently declared that the Fort Calhoun nuclear power plant in Nebraska is now safe from Missouri River floodwaters. We also heard a lot of upbeat talk from government officials in the wake of the Fukushima disaster. How concerned should we be about the safety of Fort Calhoun and the rest of the U.S. nuclear power infrastructure? I think we should be concerned about the way the Nuclear Regulatory Commission has been approaching all of these types of issues, as well as the industry itself. We need to grow our nuclear power industry, simply because we need the energy. But too many safety concerns seem to have been ignored by the agency. With respect to the Fort Calhoun plant, they really dodged a bullet in that the plant was already shut down for other reasons. But there’s really no excuse for the plant to be this close to a problem, especially since they experienced similar flooding back in 1993. Granted, they have made some safety upgrades since then, but they shouldn’t be this close to another problem. And if this were an operating nuclear plant – that is, if the nuclear reactor were producing energy – there would be some serious concerns about what might happen. With nuclear power, it only takes a minor error to create a major problem, and that should be a concern for all of us. Why have some companies been increasingly lax with public safety? Is it because the money spent on safety would otherwise eat into profits, or have regulators just not been tough enough with them? I would say both. The problem is, you have a short-term cost-savings that can then translate into a huge long-term economic problem. The best example of that is the Department of the Interior’s regulation of the BP oil spill. Here you take some short-term cost-saving measures at the expense of safety. Well, in the long-term, you’re going to lose, not only everything you’ve saved, but perhaps the entire company. But the greater concern should be with the bloated NRC, because they are not adequately monitoring the safety concerns. The commission, like a lot of other government agencies over the last 40 years, has been growing exponentially – even though the nuclear power industry itself hasn’t been growing since the Three-Mile Island incident in 1979. That was the wrong thing to happen, because now we have all of these aging nuclear power plants, and 75 percent of them are leaking tritium into the groundwater. We’ve also lost the continuity of how to upgrade the older plants. We don’t have an industry that knows how to upgrade what’s been aging for the last 40 years. The plants were only built with a lifespan of 40 years, so now what? The NRC has been turning a blind eye to the red lights that have been flashing – they’re kicking the can down the road or lowering the standards that have been around for 40 years. They’ve been relicensing these aging nuclear power plants. There’s been no independent watchdog or auditing for what’s been going on. They’ve lost the managerial oversight that they should be exercising. Is it unrealistic to expect a problem-free world when it comes to energy? Problems are always going to happen. Both industry and government know that, and they should be prepared to address it. That’s what regulatory government is for. They’re called the Nuclear Regulatory Commission – but they’re not regulating. And that hurts the industry, our energy policy and the public.

## AT: Natural Gas Solves

### Natural gas still causes warming

GARDINER ’11 (Beth. Staff Writer for The New York Times. “Is Natural Gas Good, or Just Less Bad?” http://www.nytimes.com/2011/02/21/business/energy-environment/21iht-renogas21.html. February 22, 2011) AP

LONDON — Natural gas is billed by its supporters, including President Barack Obama, as a clean fuel that could play a big role in a low-carbon future. But others are questioning the environmental credentials of an energy source that, while easier on the atmosphere than coal and oil, is still a fossil fuel that causes sizable emissions of climate-warming gases. Its backers say it emits only half as much carbon as coal when burned, and some environmentalists agree that it could bridge the gap until cleaner sources slowly come into use. But opponents see the push for natural gas as a distraction from more pressing priorities, like improving efficiency and generating renewable power. “We really have to be quite careful about the language we use to frame things,” said Kevin Anderson, a professor at the Tyndall Center for Climate Change Research at the University of Manchester in England. “If we call things green, we start to feel positive about it.” Natural gas, he said, “is not a positive thing, it’s just less negative.” In fact, he called it “a very bad fuel,” with “very high emissions indeed.” “They’re not as high as some other fossil fuels, but given where we need to be, to compare it with the worst that’s out there is very dangerous,” he added. Others are less critical. The Natural Resources Defense Council, an influential environmental group based in New York, wants to see U.S. coal plants converted to natural gas, said Kate Sinding, a senior attorney with the council. Reducing energy demand and promoting renewables come first, she said, “but we do see that as we get there, there is inevitably going to be a role for natural gas to play.” In addition to the carbon dioxide savings, natural gas also emits far lower levels of pollutants like nitrogen and sulfur oxides, mercury and particulate matter. Eventually, Ms. Sinding said, natural gas plants could be paired with solar and wind farms, which generate intermittent supply and need backup. Still, even if gas burns more cleanly than coal and oil, its production is often so dirty that it undermines the environmental gains, she said. U.S. and state regulators must tighten rules that have failed to reduce the serious problem of methane leaks and protect the quality of air and drinking water, Ms. Sinding said. Natural gas is composed largely of methane, which, if leaked unburned, is a powerful greenhouse gas. Also, poorly built gas wells can contaminate nearby aquifers. “In theory it can be reasonable, but we’re just falling far short of what we need to be doing for it to realize its promise,” she said. Much of the enthusiasm in the United States and Europe for natural gas comes from its relative abundance, and its location in places friendly to the West. The United States in particular has plentiful supplies, now that extraction from shale rock has boomed into a big industry. “Gas is much better distributed around the world than oil,” said Michael Webber, associate director of the Center for International Energy and Environmental Policy at the University of Texas at Austin. “We keep finding it.” Many environmentalists are not convinced, noting that a growing number of new finds are in hard-to-reach areas or require unconventional forms of extraction, making exploitation riskier, more expensive and more energy-intensive. Still, Mr. Webber said, “If we can really produce gas in a safe, clean way and it’s as abundant as people say, it doesn’t take us all the way to a zero-carbon future, but it’s clearly a big step in the right direction.” The advantages of gas, which include the low capital cost and short turnaround time for building new plants, make it essential for reducing carbon emissions quickly, said Beate Raabe, director of European Union affairs at the International Association of Oil and Gas Producers, a trade group based in Brussels. In the longer term, she said, carbon-capture technology could make gas plants part of a green future. Mr. Obama appeared to share such optimism when he mentioned natural gas in his State of the Union speech last month, surprising environmentalists by listing it along with solar, wind, nuclear and so-called clean coal power as key parts of a national clean-energy strategy. But some remain skeptical of the idea that natural gas can serve as a bridge to a cleaner renewable energy future. “How long and how wide is this bridge?” asked Ms. Sinding, of the Natural Resources Defense Council. “The more we put into natural gas, the greater the concern that we lock ourselves into burning natural gas and not substituting for it.”

### Natural gas links to same problems as oil and coal- resource wars inevitable

Heinberg ’11 (Richard Heinberg, American journalist and educator who has written extensively on ecological issues, including oil depletion. He is the author of at least ten books. “Rising Cost of Fossil Fuels and the Coming Energy Crunch” http://oilprice.com/Energy/Energy-General/Rising-Cost-of-Fossil-Fuels-and-the-Coming-Energy-Crunch.html. July 12, 2011) AP

During the past century, world economic growth has depended largely on ever-expanding use of hydrocarbon energy sources: oil for transportation, coal and natural gas for electricity generation, oil and gas for agricultural production. It is no exaggeration to say that the health of the global economy currently hinges on increasing rates of production of these fuels. However, oil, gas, and coal are non-renewable resources that are typically extracted using the “low-hanging fruit” principle. That is, large concentrations of high-quality and easily accessed fuels tend to be depleted first. Thus, while the world is in no danger of running out of hydrocarbon energy sources anytime soon, oil, gas, and coal extraction efforts are increasingly directed toward low-quality, hard-to-produce fuels that require higher up-front investment and entail increasing environmental costs and risks. These trends are easily demonstrated in the case of oil. Dependency: The dependence of the world economy on oil is illustrated by the close correlation between oil price spikes and US economic recessions that has been noted by several analysts. Declining resource quality: The pace of world oil discoveries has been declining since 1964. Oilfields found during the past decade have tended to be smaller, on average, than those located decades earlier, and tend to require expensive new technologies (including horizontal drilling, deepwater drilling, and hydrofracturing) for their development. As Jeremy Gilbert, former chief petroleum engineer for BP, has put it, “The current fields we are chasing we’ve known about for a long time in many cases, but they were too complex, too fractured, too difficult to chase. Now our technology and understanding [are] better, which is a good thing, because these difficult fields are all that we have left.” Increasing upstream production costs: The cost of developing a new barrel of oil’s worth of production capacity has increased dramatically in recent years. In 2000, the oil industry remained profitable with prices pivoting around $20 per barrel. Today it is estimated that oil prices of $60 to $80 per barrel are required in order to incentivize new exploration and production in many prospective regions. Increasing environmental risks and costs: As drillers operate in ever more hostile and fragile environments, accidents can have far worse consequences on ecosystems and human economies that depend on ecosystem services. This trend was forcibly illustrated by the Deepwater Horizon blowout in the Gulf of Mexico in 2010. Lower-quality hydrocarbon resources typically also entail higher carbon emissions per unit of energy produced. Coal and natural gas likewise exemplify these trends, though in somewhat different ways. While global coal reserves estimates have been used to justify the oft-repeated assertion that the world has hundreds of years of supplies, recent studies suggest world coal production could peak and begin to decline within the next 20 years. The most heralded recent development in natural gas industry is the application of hydraulic fracturing technology to production from low-porosity formations to boost reserves; however, this new technology poses increased environmental risks while entailing higher production costs. Together, coal, oil, and gas contribute to the overall societal cost of anthropogenic climate change. The ultimate burden of climate change on the world economy has been variously estimated; in the worst-case scenario (a global average temperature increase of five or more degrees Celsius), the economy simply would not survive. On the other hand, however, action by governments to limit climate change will almost certainly directly or indirectly increase the price of fossil fuels, adding to price increases resulting from depletion. As fossil fuels become more scarce and expensive, international conflict over remaining supplies, especially of oil and gas, is likely to become more heated—a trend already clear in the South China Sea and Central Asia. The replacement of fossil fuels with alternative sources of energy is clearly necessary, but presents the world with an unprecedented technical challenge. Transport systems (autos, buses, trucks, trains, aircraft, and ships) can in some cases be electrified; in other cases, petroleum-based liquid fuels can be replaced with biofuels. Electricity can be produced from sunlight and wind rather than coal and gas. However, alternative energy sources currently provide only a tiny portion of current world energy, so a build-out will require enormous investment over several decades. Moreover, when the prospects of alternative energy sources are evaluated using all important criteria (including the amount of energy returned on the energy invested in energy production, or EROEI; environmental impacts; size of the resource; and variability in flow rates), it is difficult to identify a realistic scenario in which total world energy supplies can continue to grow—or even remain constant—as fossil fuels deplete. Thus, even if governments act wisely now to develop energy alternatives at maximum possible rates, the world faces a nearly inevitable energy crunch during the next few decades. Governments must therefore develop strategies for energy conservation. Not only must much greater efficiency be brought to energy production and usage, but essential and non-essential uses of energy must be differentiated, with essential uses prioritized and non-essential uses discouraged.

### Natural gas not sustainable- limited supplies

Heinberg ’05 (Richard Heinberg, American journalist and educator who has written extensively on ecological issues, including oil depletion. He is the author of at least ten books. “The Party’s Over - Oil, War, and the fate of Industrial societies”. June 1, 2005) AP

Many industry analysts believe the outlook for future discoveries in North America is far less favorable than HIA forecasts suggest. In the decade from 1977 to 1987,9,000 new gas fields were discovered, but the following decade yielded only 2,500 new fields. This general downward trend in discovery is continuing, despite strenuous efforts on the part of the industry. Matthew Simmons has reported that the number of drilling rigs in the Gulf of Mexico grew by 40 percent between April 1996 and April 2000, yet production remained virtually flat. That is largely because the newer fields tend to be smaller; moreover, because of the application of new technology, they tend to be depleted faster than was the case only a decade or two ago: new wells average a 56 percent depletion rate in the first year of production. In a story dated August 7, 2001, Associated Press business writer Brad Foss noted that in the previous year, "there were 16,000 new gas wells drilled, up nearly 60 percent from 10,400 drilled in 1999. But output only rose about 2 percent over the same period, according to estimates from the Energy Department. The industry is on pace to add 24,000 wells by the end of the year, with only a marginal uptick expected in production."1 In June 1999, Oil & Gas Journal described how the Texas gas industry, which produces one-third of the nation's gas, had to drill 6,400 new wells that year to keep production from plummeting. Just the previous year, only 4,000 wells had to be drilled to keep production steady.4 According to Randy Udall of the Community Office for Resource Efficiency in Aspen, Colorado, no one likes talking about |natural-gas| depletion; it is the crazy aunt in the attic, the emperor without clothes, the wolf at the door. But the truth is that drillers in Texas are chained to a treadmill, and they must run faster and faster each year to keep up." US natural gas production has been wavering for years; in order to make up for increasing shortfalls, the nation has had to increase its imports from Canada, and Canada is itself having to drill an increasing number of wells each year just to keep production steady — a sign of a downward trend in discovery. A May 31, 2002 article by Jeffrey Jones for Reuters, entitled "Canada Faces Struggle Pumping More Natgas to US," begins ominously: "Canadian natural gas production may have reached a plateau just as the country's role as supplier to the United States is becoming more crucial due to declining US gas output and rising demand. Furthermore, Mexico has already cut its gas exports to the US to zero, and has become a net importer of the fuel. A gas pipeline from Alaska could help, but not much. A three-foot-diameter pipeline would deliver only two percent of the projected needs for the year 2020. Nearly all of the natural gas used in the US is extracted in North America. While gas is more abundant in the Middle East, which has over a third of the world's reserves, the amount that could be transported by ship to the American market is limited. The shipment process itself is feasible (there is only a 15 percent energy penalty from cooling and transportation), but the US has only tour liquefied natural gas offloading terminals at present, and it will take time and considerable investment to build more. Moreover, nearly all of the existing I.NG shipping capacity is spoken for by Japan, Korea, and Taiwan through long-term contracts. Europe and the Far East may be able to depend on gas from the Middle East and Russia for several decades to come, but that is probably not a realistic prospect for the US. The public got its first hint of a natural gas supply problem in the latter months of 2000, when the wellhead price shot up by 400 percent. This was a more dramatic energy price increase than even the oil spikes of the 1970s. Homeowners, businesses, and industry all suffered. This gas crisis, together with simultaneous oil price hikes, helped throw the nation — and the world — into recession. Farmland Industries shut down some of its fertilizer plants because it could not afford to use expensive natural gas to make cheap fertilizer; many consumers were dismayed to find that their utility bills had doubled. A frenzy of new drilling resulted, which, together with a scaling back of demand due to the reces sion, enabled the natural gas market to recover so that prices eased back. Vet by the spring of2001, wellhead gas prices were still twice what they had been twelve months earlier, and gas in storage had reached its lowest level ever. The nation narrowly averted serious shortages again in 2003; however, unusually mild winter and summer weather in 2004 enabled the refilling of underground gas storage reservoirs. The US has managed to avoid a train wreck so far, but given declining production, the event seems inevitable, whether it occurs this year or next. The increasing demand for gas is coming largely from an increasing demand for electricity. To meet growing electricity needs, utilities in 2000-2001 ordered 180,000 megawatts of gas-fired power plants to be installed by 2005. This strategy seemed perfectly logical to the utilities\* managers since burning gas is currently the cheapest and cleanest way to convert fossil fuel into electricity. But apparently no one in the industry had bothered to inquire whether there will be enough gas available to fire all of those new generators over their useful lifetime. Many exploration geologists are doubtful. By mid-2002, plans for many of those new gas-fired plants were being cancelled or delayed. Does natural gas extraction follow the same Hubbert curve as does oil extraction? Oil wells arc depleted relatively slowly, whereas, as we have seen, gas wells — especially newer ones — often deplete much more quickly. The typical natural gas well production profile rises from zero, plateaus for some time, and then drops off sharply. However, in aggregate, combining all of the natural gas wells in a country or large geographical region, extraction does follow a modified Hubbert curve, with the right-hand side of the curve being somewhat steeper than that for crude. Hence, natural gas will not solve the energy-supply problem caused by oil depletion; rather, it may actually compound that problem. Our society is already highly dependent on natural gas and becoming more so each year. But soon we are likely to see a fairly rapid crash in production. As my colleague Julian Darley has written in his book Hipb Noon for Natural Gas: The New Energy Crisis, "The coming shortage of natural gas in the United States and Canada, compounded by the global oil peak and decline, will try the energy and economic systems of both countries to their limits. It will plunge first the United States, then Canada, into a carbon chasm, a hydrocarbon hole, from which they will be hard put to emerge unscathed."0 Many alternative energy advocates have described natural gas as a "transition fuel" whose increased usage can enable the nation to buy time for a switch to renewable energy sources. However, in view of the precarious status of North American gas supplies, it seems more likely that any attempt to shift to natural gas as an intermediate fuel would simply waste time and capital in the enlargement of an infrastructure that will soon be obsolete anyway — while also quickly burning up a natural resource of potential value to future generations.

# \*\*\*2AC\*\*\*

## \*\*\*Politics\*\*\*

## Plan pop- Bipart

### Plan is popular-SBSP has bipartisan support

Singer 7 (Jeremy Singer, Staff Writer at Space in MSNBC, “Pentagon may study space-based solar power”, http://www.msnbc.msn.com/id/18056610/ns/technology\_and\_science-space/t/pentagon-may-study-space-based-solar-power/, 4/11/07) SV

Jeff Kueter, president of the Marshall Institute, a Washington think tank, said it is too early to determine if space-based solar power is viable, but said that if the concept is successful, it could be a potential “game changer” for energy use. The concept could find broad bipartisan support as it could meet the desires both of conservatives seeking to end dependence on foreign energy sources, as well as liberals who are looking for an environmentally friendly source of energy, Kueter said. While space-based solar power may sound like a high-risk proposal, it is worth investing several million dollars in the near term to study the concept because of the potential high payoff, Kueter said. If the studies indicated that the concept might be feasible, it would be worthwhile for the Pentagon to conduct flight demonstrations to prove out the technology in space, he said. If the Pentagon chose to pursue flight demonstrations or deployment of a space-based solar power system, it could share costs by partnering with NASA, the Department of Energy and other government agencies, Kueter said.

## 2AC Plan popular- Defense Industry

### Defense sector loves the plan – business interests

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

There was clear interest from potential military ground customers—the Army, Marines, and USAF Security Forces, and installations personnel, all of which have an interest in clean, low environmental‐impact energy sources, and especially sources that are agile without a long, vulnerable, and continuing logistics chain. There was clear interest from both traditional “big aerospace,” and the entrepreneurial space community. Individuals from each of the major American aerospace companies participated and contributed. The subject was an agenda item for the Space Resources Roundtable, a dedicated industry group.

### And, the military’s key to the agenda— Defense spending overcomes Congress’ opposition to renewables

Kaplan, ’10 – Senior Fellow at the New America Foundation [Fred, 10/6/2010, Slate Magazine, “The Marines Go Green,” http://www.slate.com/id/2270165/pagenum/all/#p2, DS]

Two other factors increase the chances that the military's renewable-energy projects might have commercial spinoffs. First, as with the microchip and the computer, these projects are adapting products that private companies have already developed and built. In other words, the military is bypassing its normal procurement process, with its bureaucratic hassles and excessive "requirements," which have resulted in the unwieldy designs and exorbitant costs of so many U.S. weapons systems. Second, Congress is more likely to fund these projects precisely because they're related to the national defense. The United States has an elaborate nationwide highway system today because, back in 1956, President Dwight Eisenhower sold the program to Congress by calling it the National Interstate and Defense Highway Act (italics added). The Army, Eisenhower said, would need solid highways to move troops or evacuate citizens in the event of a foreign invasion or a nuclear war. Similarly, after the Soviet Union launched the Sputnik satellite in 1957, state governments across the United States spent scads of money to create, or improve, high-school science and math programs in order to "catch up" with the Russians. (This impulse wasn't limited to science and math. At the high school I attended in Kansas, money was even appropriated to buy books for a course on the modern novel. The course was still around in the early 1970s, and thus was I exposed at an early age to Conrad, Crane, Hawthorne, and Hemingway.) Congress today has little appetite for spending billions of dollars on solar power generators or biofuel labs under the rubric of energy independence or "going green." But to serve the war mission, and especially to protect the troops, no sum is too lavish—and that's why the road to going green, and to achieving energy independence, might very well be paved through the fighting fields and villages of Afghanistan.

## Ext-Military loves the plan

### Military loves the plan – They want the power

Boyle, ‘7 – science editor at MSNBC [Alan, MSNBC, “Power from space? Pentagon likes the idea,” http://www.msnbc.msn.com/id/21253268/ns/technology\_and\_science-space/t/power-space-pentagon-likes-idea/, DS]

A new Pentagon study lays out the roadmap for a multibillion-dollar push to the final frontier of energy: a satellite system that collects gigawatts’ worth of solar power and beams it down to Earth. The military itself could become the “anchor tenant” for such a power source, due to the current high cost of fueling combat operations abroad, the study says. The 75-page report, released Wednesday, says new economic incentives would have to be put in place to “close the business case” for space-based solar power systems — but it suggests that the technology could be tested in orbit by as early as 2012. "I think we have found the killer application that we have been looking for to tie everything together that we're doing in space," Air Force Col. Michael V. "Coyote" Smith, who initiated the study for the Defense Department's National Security Space Office, told msnbc.com on Thursday. Space advocacy groups immediately seized on the idea and formed a new alliance to push the plan. But a representative of the solar-power industry was doubtful that space solar power would move from the realm of science fiction into reality anytime soon. "You've got a lot of technology breakthroughs that you have to make," Mike Taylor, technical services manager for the Solar Electric Power Association, told msnbc.com. Charles Miller, president of Space Policy Consulting as well as president and chief executive officer of Constellation Services International, said the key to the plan's success has more to do with economics than physics. "The issue here is not technology, OK?" said Miller, who was a contributor to the study. "You could figure out how to do space solar power in the '70s. [But] you couldn't close the business case in the '70s. You couldn't close it in the '90s. How do you close the business case? That is the No. 1 question to be answered." Economic equation is changing The report — which was done on an unfunded basis and took advantage of online collaboration with outside contributors — notes that several factors have changed in the decade since NASA took its most recent in-depth look at the space power concept (PDF file). Today's best solar cells are about three times as efficient as they were in 1997, while crude-oil prices are roughly three times as high. And in the post-9/11 era, energy security has taken on far more importance. "The technology has advanced vastly, and the security situation has changed quite a bit, as well as the economic situation," Marine Lt. Col. Paul Damphousse, who took over the study from Smith last month, told msnbc.com. "Those things warranted another look." Those factors still don't make space solar power attractive for commercial users, but a better case could be made for the Defense Department. The U.S. military pays a premium for its power in the battlefield, when you consider the cost of shipping oil out of the Middle East, refining it, then shipping the fuel back to the combat zone and burning it in electrical generators, Miller said. All that brings the current power price tag to $1 or more per killowatt-hour, compared with 5 to 10 cents on the domestic market, the report says. Even then, the economic equation still doesn't add up, due primarily to the high cost of launching payloads to orbit. But in the near future, the U.S. military could become a potential "anchor tenant customer" for space-generated power, the report says. "The business case may close in the near future with appropriate technology investment and risk-reduction efforts by the U.S. government, and with appropriate financial incentives to industry," the report says. Smith said the military would prefer to buy its power from a commercial space provider, rather than operating the system itself. "It is our goal to move this entire project out of DOD [the Department of Defense] as quickly as possible," he said. "Energy is not our business. We want to be a customer." How it could work The report sketches out how a space-based solar power system could work: A network of satellites would be constructed in space with arrays of lightweight mirrors extending for several miles (kilometers) on each side. Those mirrors would focus sunlight on solar cells, generating electrical power. The electricity would be converted into microwaves suitable for transmitting through Earth's atmosphere, at frequencies of 2.45 or 5.8 GHz. The microwaves would be directed down to antenna arrays on Earth, as a beam of radiation about one-sixth as intense as noon sunlight. The antennas would convert the radiation back into electricity for distribution via conventional grids. The commercial systems discussed in the past would deliver 5 to 10 gigawatts of power. In contrast, the Pentagon study calls for military systems providing 5 to 50 megawatts of continuous power — roughly a thousandth as much. The report's roadmap calls for ground-based technology development over the next few years, leading up to a demonstration in low Earth orbit in the 2012-2013 time frame, and in geosynchronous orbit by 2017. However, the report makes no commitment for funding such a demonstration. Smith said that would be up to other agencies — such as the Pentagon's own Defense Advanced Research Projects Agency, or NASA, or the proposed Advanced Research Projects Energy. Damphousse said the program could use an "incremental approach," starting with experiments to transmit power wirelessly between ground stations placed miles apart. "If you can do that, then you're well on your way to proving you can do it from space," he said. A follow-up experiment could try transmitting power from the international space station to Earth. "I actually met with a bunch of folks at NASA Ames last week ... and they warmed to the idea immediately," Damphousse said. Damphousse said the geosynchronous system would require an investment on the order of $10 billion, but would serve as a proof of concept for commercial space power systems. Smith said such systems could eventually deliver electricity to places that lack the infrastructure for traditional power transmission grids, and turn the decades-old dream of wireless power into reality. "It's using space for an actual tradeable commodity — not for a rover on Mars, which is also necessary — but actually delivering a commodity that can be given to anybody in the world," he said. Time for a reality check In conjunction with the Pentagon report's release, 13 space advocacy and research organizations announced the formation of the Space Solar Alliance for Future Energy, which pledged to push for implementation of the space power plan. "While the technical challenges are real, significant investment now can build space solar Power into the ultimate energy source: clean, green, renewable, and capable of providing the vast amounts of power that the world will need. Congress, federal agencies and the business community should begin that investment immediately,” Mark Hopkins, senior vice president of the National Space Society, said in a written statement.

### Existing efforts prove

Iannotta, ‘9 - Space News Staff Writer [Becky, 2/25/2009, Space, “Space Solar Power Crowd Bets on Obama,” http://www.space.com/3317-space-solar-power-crowd-bets-obama.html, DS]

Alternative energy advocates are not the only ones interested in space solar power beaming; the U.S. military is also eying the technology as a possible means of delivering power to remote areas of the globe. The Air Force Academy, for example, has begun building two small satellites to test the concept of transmitting solar power from space via laser technology. That demonstration is expected to produce enough power to illuminate a single one-tenth-of-a-watt light emitting diode, or LED. Meanwhile, the space station power beaming experiment has won support from Gary Payton, undersecretary of the Air Force for space. Following a briefing on the proposed demonstration, Payton wrote Bill Gerstenmaier, NASA?s space operations chief, to say the space agency and Pentagon should begin exploring ways to collaborate on solar power beaming experiments. ?I believe it is time for NASA and [the Defense Department] to collaborate on a project to demonstrate safe space-to-earth transmission of solar energy is possible, and scalable to a magnitude that can enhance national security interests,? Payton said in the Sept. 30 letter.

## Plan popular- Public

### Public loves the plan – polls prove

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

There is reason to think that this interest may extend to the greater public. The most recent survey indicating public interest in SBSP was conducted in 2005 when respondents were asked where they prefer to see their space tax dollars spent. The most popular response was collecting energy from space, with support from 35% of those polled—twice the support for the second most popular response, planetary defense (17%)—and three times the support for the current space exploration goals of the Moon (4%) / Mars(10%). How does one account for such significant interest? Perhaps it is because SBSP lies “at the intersection of missionary and mercenary”—appealing both to man’s idealism and pragmatism, the United States’ special mission in the world and her citizens’ faith in business and technology. As an ambitious and optimistic project, it excites the imagination with its scale and grandeur, besting America’s previous projects, and opening new frontiers. Such interest goes directly to the concerns of the Aerospace commission, which stated, “The aerospace industry has always been a reflection of the spirit of America. It has been, and continues to be, a sector of pioneers drawn to the challenge of new frontiers in science, air, space, and engineering. For this nation to maintain its present proud heritage and leadership in the global arena, we must remain dedicated to a strong and prosperous aerospace industry. A healthy and vigorous aerospace industry also holds a promise for the future, by kindling a passion within our youth that beckons them to reach for the stars and thereby assure our nation’s destiny.”

### And, they’re key to the agenda – comparatively outweigh organizations and parties

Burstein, ‘3 - Professor of Political Science at University of Washington [Paul, 2003, Political Research Quarterly, “The Impact of Public Opinion on Public Policy: A Review and an Agenda,” http://prq.sagepub.com/content/56/1/29, DS]

This review has shown that: (1) Public opinion affects policy three-quarters of the times its impact is gauged; its effect is of substantial policy importance at least a third of the time, and probably a fair amount more. (2) Salience does affect the impact of public opinion on policy. (3) The impact of opinion on policy remains substantial when the activities of interest organizations, political parties, and elites are taken into account; but the paucity of data on interest organizations and elites mandates great caution when interpreting the results. (4) The hypothesis that government responsiveness to the public has changed over time cannot be definitively rejected, because so little evidence is available; but that evidence does not support the hypothesis. (5) Our ability to generalize about the impact of opinion on policy is severely compromised by the narrow focus of available work, both geographically and in terms of issues. Overall, the findings about responsiveness seem quite robust, not strongly affected by the activities of political organizations or elites, type of issue, or time. Yet it is also surprising how little has been published in major journals, or referred to in major reviews, about critical topics concerning public opinion and public policy. The publications reviewed suggest two agendas for future research, one substantive and one methodological.

## 2AC Plan Popular- NASA Transition Team

### Plan popular – Obama team’s full of space and energy wonks

DailyKos, ‘8 – [DailyKos, 12/12/2008, “Space Solar Power: Politically Possible, finally?” http://www.dailykos.com/story/2008/12/12/672371/-Space-Solar-Power:-Politically-Possible,-finally, DS]

While obviously Obama's and his planned administration have not endorsed the idea, its worth noting the team that Obama is putting together, that would have to address these issues. The NASA transition team is full of people who believe in the potential of space and large scale space development. Secretary of Commerce (to be) is Bill Richardson, who has been a very vocal proponent of Space and Space development, while he was governor of New Mexico. Dr. Steven Chu has been nominated to be Secretary of Energy, and he has been a big supporter of solar power.

### It outweighs – government push can overcome structural opposition

Boswell, ‘4 – Space writer and contributor to Space Review [David, 8/30/2004, The Space Review, “Whatever happened to solar power satellites?,” http://www.thespacereview.com/article/214/1, DS]

There were over 60 launches in 2003, so last year there was enough money spent to put something into orbit about every week on average. Funding was found to launch science satellites to study gravity waves and to explore other planets. There are also dozens of GPS satellites in orbit that help people find out where they are on the ground. Is there enough money available for these purposes, but not enough to launch even one solar power satellite that would help the world develop a new source of energy? In the 2004 budget the Department of Energy has over $260 million allocated for fusion research. Obviously the government has some interest in funding renewable energy research and they realize that private companies would not be able to fund the development of a sustainable fusion industry on their own. From this perspective, the barrier holding back solar power satellites is not purely financial, but rather the problem is that **there is not enough political will to make the money available** for further development. In the long term, launch costs will need to come down before generating solar power in space makes economic sense. But is the expense of launching enough to explain why so little progress has been made? There is a very interesting discussion on the economics of large space projects that makes the point that “the fundamental problem in opening any contemporary frontier, whether geographic or technological, is not lack of imagination or will, but lack of capital to finance initial construction which makes the subsequent and typically more profitable economic development possible. Solving this fundamental problem involves **using one or more forms of direct or indirect government intervention** in the capital market.

## 2AC Plan Popular- Tea Party

### Plan popular – Tea Party stars love the jobs

Hendin 7/8 – writer for CBS News [Robert, 7/8/11, CBS News, "Could NASA be on the chopping block? ", http://www.cbsnews.com/8301-503544\_162-20077757-503544.html, DS]

As NASA prepares for the final launch of the space shuttle, it finds itself in a potentially troubling spot. As Washington works to cut spending, without a storied space vehicle, one could ask: is the space program worth it? NASA has an annual budget of some $18 billion. That spending includes $4.5 billion on "science"; $3.7 billion on "exploration"; $3 billion on "cross-agency support" and $6.1 billion on "space operations." The agency has no replacement for the shuttle, so to continue manned space operations, including trips to the International Space Station, NASA will rely on its partnership with Russia to ferry astronauts into space, and potentially on commercial spacecraft. NASA predicts it will save over $2 billion by not operating the Space Shuttle, though that money will be allocated to other programs, including working with the private sector toward development of a shuttle replacement. At a time when the government faces annual deficits over a trillion dollars and a debt at $14 trillion and rising, should NASA's nearly $20 billion be on the chopping block? No, says **Tea Party backed** freshmen Senator Marco Rubio, who's home state of Florida is home to Cape Canaveral and the Kennedy Space Center, the birthplace and launching point of the space shuttle. "The impact of our space program is a global phenomenon," said Rubio speaking on the Senate floor today. "Our space program inspired young generations of Americans to pursue careers in the aerospace industry and other related fields. Satellite technologies developed and improved by NASA now connect the world in unprecedented ways and support our military reconnaissance missions and facilitate travel through G.P.S. devices. For others, it got them hooked on math and science and let them to other fields whose innovations make our lives better every single day." Rubio's Florida has seen a huge economic boom from the space program. According to the Congressional Research Service, the shuttle program employs over 2,000 civil servants with more than 15,000 people employed by contractors. The program has at least 4,000 suppliers located around the country. And according to a study conducted earlier this year by Florida State University, there are over 147,000 jobs related to the aerospace industry in Florida alone, 51,000 are direct jobs and 95,000 are indirect or induced jobs due to the industry. Those jobs bring in 8.3 billion in income. Though Rubio and many others ran for Congress on a pledge to cut government spending, even without the space shuttle, which has defined the American space program for over 30 years, the senator says **NASA is an important investment**, even if it too has to live within its means. "You see, whereas America once led the way to the moon, we now face the unacceptable prospect of limited options to simply get a human into orbit," Rubio said. "We know that our commercial space partners are working to fill some of the gap in our human space flight capabilities, and that is a promising development that we should encourage." "But we need NASA to lead," he added. "And I say this, I fully recognize that our nation faces a debt crisis because, quite frankly, politicians in both parties have spent recklessly for many decades, and it will require Washington to finally live within its means and for leaders to make tough choices about what our nation's priorities are. NASA is no exception. It will not be about spending more. It will be about spending wisely."

### They’re key to the agenda – budget talks prove

Morgan 4/9 - Writer for CBS News, citing Rep. Steven King, R-Iowa [David, 4/9/2011, CBS News, “King: Budget fight shows strength of Tea Party,” http://www.cbsnews.com/2102-500202\_162-20052409.html, DS]

A budget agreement reached late Friday night avoided a shutdown of the federal government when Democrats and Republicans agreed to $38.5 billion in cuts from the 2011 budget - more than half of the $61 billion Republicans had been seeking. Conservatives were not successful in their bid to defund Planned Parenthood, defund the president's health care law, or restrict the EPA. House Speaker John Boehner claimed victory: "I'm pleased that Senator Reid and I and the White House have been able to come to an agreement that will, in fact, cut spending, and keep our government open," he said. Final passage of that short-term spending bill came around 12:20 a.m. in the House. Government shutdown averted as last-minute deal reached Rep. Steve King, R-Iowa, was one of the 28 Republicans who voted against the budget compromise. On "The Early Show on Saturday Morning," King said Republicans held their ground as long as they could to try to get what he said was his priority: cutting off funding for the president's health care reform law. "I've taken the stand all along, for a year, that if Republicans win the majority, we must first vote to repeal 'Obamacare,' and then use all of our leverage and every appropriations bill to cut off the funding that would be used to implement or enforce it," King told anchor Erica Hill. "Two federal courts have found it unconstitutional. The White House is delaying the Supreme Court review of this, while tens of billions are spent implementing a piece of legislation that America has rejected, and I believe the Supreme Court will also reject, and I thought we should have used our leverage in order to cut off all funding." When asked if Boehner failed because the final agreement did not remove funding for the health care law, King said, "Well, I wouldn't go so far as to say that. He had a different set of priorities. A lot of political capital was used on the cuts. And by the time we got through that, we just didn't have enough leverage left to work on what I thought was the most important issue, and I think history will show that." "Would you have rather seen, this morning, then, a government shutdown?" Hill asked. "In the long run, we needed to be able to face a government shutdown and hold our ground - it's worth it," King replied. "That's $2.6 trillion in outlays the first full ten years of Obamacare. And if we're not willing to face the threat of a shutdown, which was being threatened of course by Harry Reid and discussion was initiated there, you're not as strong in your negotiations if you're not willing to use the tools that the other side is using. They were willing to use the shutdown. We were not. I think we could have gotten more if we would have been willing to face a shutdown."` King said he believes that, if the government had been forced to shut down, the American people would side with him and Republicans holding out for more cuts. "There would have been an intense public discussion like there was in '95," he said. "They get a hold of their members of Congress, who get a hold of their leaders, and over time, some people decide to change their position because of the pressure. That would have been decided. But I think the American people would have sided with us. "What I want to do is fund all the legitimate functions of government, none of Obamacare. I think that bright line would have put the president in a bad position of having to say that his signature piece of legislation is more important to him than all of the functions of government all put together," King said. King said the experience shows the power of the Tea Party movement. "There's a tremendous amount of leverage there," he said. "There are 87 freshmen in this Congress. Quite a few of them are here because of the support of the Tea Party. I think we'll see the next vote, a little bit stronger Tea Party. And then they've got to be engaged with the members of Congress in a personal way. "I think they're going to get strong and stronger. And I know they're looking to the 2012 election now. So, we will see, as days and weeks and months unfold, this is not a one-shot deal. They know it and we know it." King also talked of the upcoming debate about the 2012 budget, which includes the proposal by Republican Paul Ryan that seeks to cut $4.4 trillion in government spending over the next decade, including a restructuring of Medicare/Medicaid, repealing the health care reform law, and lowering tax rates for the wealthy and corporations. "You know, that's something that concerns me a lot about this - that you always want to use the highest leverage point to be able to achieve your most difficult goal. And so as we move forward, the Ryan budget will be debated, but it doesn't have the force and effect of law, so it's just a debate point," he said. King then predicted the Democratic Senate leader would try to block debate on the Ryan proposal, leading to inaction and yet another threat of government shutdown. "We will go through 12 or 13 appropriations bills. I think we'll debate them intensively in the House, and I think Harry Reid will put them in his desk, take none of them up until the last week in September where he'll put them all in one big omnibus spending bill, make his changes and add his money and drop that on our desk at the end of September and we'll be at another crisis of the threat of another shutdown."

## Plan Popular- Renewables Lobby

### Alternative energy lobby’s strong – they’ll make the plan popular

LaRussa, ’10 – independent clean energy political analyst [Cassandra, 3/30/2010, Open Secrets, “Solar, Wind Power Groups Becoming Prominent Washington Lobbying Forces After Years of Relative Obscurity,” http://www.opensecrets.org/news/2010/03/solar-wind-power-becoming-prominent.html, DS]

In 1998, the entire alternative energy industry barely even registered as a political player in Washington, spending a mere $2.4 million on lobbying the federal government. Meanwhile, in the same year, the oil and gas, electric utilities and mining industries spent a combined $142 million advancing their own legislative interests. That landscape, however, has changed considerably. By 2007, the alternative energy industry had begun to drastically increase its lobbying spending, almost doubling its expenditures from the previous year. In 2009, alternative energy organizations shelled out an unprecedented $30 million to protect and promote their interests on Capitol Hill. The alternative energy industry’s lobbying expenditures have grown to 12 times from its 1998 level. In comparison, oil and gas spending and mining spending have grown less than three times their 1998 amount, and electric utility spending has grown to just twice its 1998 amount. The growing involvement of the alternative energy industry in legislative affairs is reflected not just in increased spending, but also in the number of companies and organizations that employ federally registered lobbyists. In the late 1990s, only about 20 alternative energy industry organizations used federal lobbyists. By 2009, there were about 200 alternative energy companies and organizations employing lobbyists to help advance the industry’s interests. The American Wind Energy Association is one of those organizations that recently and significantly increased lobbying efforts. Until 2008, AWEA failed to crack the $1 million mark in annual lobbying expenditures -- and most years, it spent less than $500,000. In 2009, its expenditures experienced a drastic increase, and the group spent almost $5 million on lobbying for issues related to the wind power industry. But why did AWEA, and scores of other alternative energy corporations, trade organizations and non-profits, get involved in legislative affairs so suddenly and with such gusto? The involvement stems from the growth in number of alternative energy companies, which was made possible by the growth in popularity of wind power in the national consciousness, said Christine Real de Azua, an AWEA spokeswoman. Real de Azua states that this, in turn, increased AWEA's ranks by more than 1,000 new business members in 2009 alone, many of them "companies entering or seeking to enter the wind turbine supply chain." Last year "was a record year for wind power in the U.S.," Real de Azua said. "The industry installed 10,000 megawatts last year, enough to generate as much new electricity as three new nuclear plants." The recent involvement of AWEA in federal affairs, she said, "reflects the urgency of the industry's number one priority -- passing a national renewable electricity standard with aggressive, binding near- and long-term targets, as part of comprehensive energy and climate legislation." Azua de Real cites "market certainty" as a concern of AWEA's members, who need legislative support of their industry "in order to expand their operations and invest in new manufacturing as well as new wind farm facilities." She added that it is imperative to the members of AWEA that the U.S. government "steps up and clearly commits to developing renewable energy." AWEA cites the sheer potential of wind energy and the opportunity for job creation as two key points that their lobbyists emphasize in the fight for favorable legislation. Not as drastic but certainly notable is the increased lobbying by the Solar Energy Industries Association. Until 2007, the organization had never spent more than half a million dollars on federal lobbying efforts. In 2009, it spent more than $1.6 million. Monique Hanis, an SEIA spokeswoman, attributes the increase in lobbying presence to a growth in membership that enabled the organization to expand legislative activities. She explains how in late 2008, SEIA's increased lobbying pressure paid off when Congress "passed the eight-year extension of the solar investment tax credit," which allowed the organization to move on to lobbying regarding climate, renewable energy standards, green jobs and appropriations. The goal of spending more money than ever before on federal legislation, Hanis says, is "to remove market barriers so that solar can compete fairly with other energy sources and we can expand the amount of solar used in this country." SEIA has already seen positive gains from their increased expenditures, Hanis said. The group’s lobbyists were successful in promoting several provisions of the stimulus bill, such as the "lifted cap on solar investment tax credit for residential solar water heating systems." In addition, the industry’s increased presence on Capitol Hill has "built bipartisan support of and knowledge about solar." But while alternative energy interests are just getting acquainted with K Street, the oil and gas industry has been a permanent resident for years. Since 1998, the oil and gas industry has never spent less than $50 million on lobbying in any given year, and in 2009, it reported $168 million in lobbying expenditures. Does a rise in alternative energy lobbying threaten to erode the oil and gas industry's political power? Probably not, said American Petroleum Institute spokesman Bill Bush, adding that he is “not concerned” about the alternative energy industry's efforts and “not aware of any impact” they're having on the petroleum industry's fortunes. Bush also emphasized that the oil and gas industry "understands that there is a role for alternative energy" and has "invested billions in it." He added, however, that "on various issues, we may be on different sides." In 2009, API focused on energy legislation and "issues related to access to oil and natural gas development," Bush said. The institute spent more than $7.3 million in 2009 on federal lobbying efforts after spending between $2.8 million and $4.8 million each year on lobbying between 2002 and 2008. As this decade moves forward, climate and energy policy remains a key issue in Congress. Barack Obama labeled such legislation a high priority long before he became president, and people and political action committees associated with the alternative energy industry responded with campaign contributions of $173,500. The oil and gas industry poured more than five times that amount into Obama's campaign coffer, but gave most of its presidential campaign contributions to Sen. John McCain (R-Ariz.). Sens. John Kerry (D-Mass.), Joe Lieberman (I-Conn.) and Lindsey Graham (R-S.C.) are currently drafting a bill to address the nation's energy needs. The bill, if passed, could certainly become a major political victory for Obama. Although most of the conversation regarding the drafting of legislation has revolved around the question of greenhouse gases and the proposed “cap-and-trade” policy, the bipartisan bill also makes a point of emphasizing job creation and the use of renewable energy. In a statement in February, Kerry promoted his energy bill by stating, "Americans want us to be energy independent. Moreover, every job created in the course of energy independence is a job that stays here at home." And with political focus on alternative energy constantly expanding, the lobbying power of the alternative energy industry may soon become as plentiful as Great Plains breezes and desert sunshine.

### They’re key to the agenda – span the business spectrum and have tons of political will

Mulkern, ‘9 - politics writer for the Denver Post [Anne C., 3/19/2009, Scientific American, “Lobbyists Swarm Washington Touting Energy Ideas,” http://www.scientificamerican.com/article.cfm?id=lobbyists-energy-ideas, DS]

There's a green gold rush on Capitol Hill. With Congress plowing toward legislation on energy and climate, lobbyists and their clients are swarming House and Senate offices. They are booking up conference rooms, shaking hands and submitting proposals for financial help and policy changes. There are hundreds of hired guns now working on the energy issues. They represent a swath of diverse and sometimes conflicting interests, from small companies turning algae into oil to traditional utilities and big corporations, including Google, United Parcel Service and Safeway. "What's happening in energy and carbon, what's being contemplated is nothing short of transformational," said Steve McBee, CEO of McBee Strategic Consulting, a lobbying firm with 31 clients interested in energy. Bills planned on energy and climate in Congress, he said, represent "an attempt to fundamentally shift the market." "There's enough momentum and political will," McBee said, adding that Congress and President Obama "have a fighting chance of getting it done." Momentum on changing energy policy began in the last two years, as state after state passed regulations promoting renewable energy. The private sector started shifting toward green power production, but that movement stalled with the economic crisis, several lobbyists and energy experts said. With credit dried up and venture capitalists ceasing investments, companies that need money for power projects are turning to the federal government. Lawmakers besieged by ideas now must decide how to weigh requests and pick which are most aligned with their constituencies' needs and policy goals. "What we're seeing is a very large number of clean energy companies and clean energy developers pursuing Congress and federal support in an effort to maintain the momentum that began 12 to 24 months ago," said Nick d'Arbeloff, president of New England Clean Energy Council, a trade group. "It won't be an easy process for any of these companies to unlock dollars for their organization," d'Arbeloff added. "But a signal is being sent by the White House and by the Department of Energy that clean energy is a priority." Companies and groups interested in energy and natural resources legislation spent nearly $355 million on lobbyists last year, up from $240 million in 2007, according to Congressional Quarterly's MoneyLine. That spending and the pool of people pleading their case are growing steadily this year as well. Since January, 185 companies hired lobbyists to work on energy issues, MoneyLine records show. Even Fortune 500 companies that have long employed lobbyists on other issues have needed to hire more to track potential energy policy changes. Established smaller companies want to shift toward clean energy. And new companies need help approaching lawmakers. "We try to listen to everybody, because we know that there is no one single solution," said Anne Johnson , spokeswoman for Republicans on the Senate Energy and Natural Resources Committee. "There's a lot of demand. There are a lot of people calling. "We know that we have to look at these technologies while also looking at cleaner traditional energy." With so many people knocking on their doors, lawmakers know they will ultimately write policies that will benefit some and exclude others. The goal, one said, is to avoid picking winners. "It is our job here to set the signals right so we have a level playing field for these clean energy companies," said Rep. Jay Inslee, (D-Wash.), who sits on both the House Energy and Commerce Committee and the Select Committee on Energy Independence and Global Warming. "Virtually any technology that has potential to be viable, they should have a seat at the table to move forward," Inslee said. Outside experts from universities, including Stanford and the Massachusetts Institute of Technology, are helping lawmakers evaluate which proposals might be commercially viable. "We're not just throwing darts here," Inslee said. Wanted: 'game changers' While lawmakers favor mature technologies that are proven and might work at a scale that could make them profitable in the future, Inslee said, Congress is also interested in innovative applications that could be "game changers," such as nanotechnology that would make solar cells more efficient. Some lobbyists, including McBee, believe businesses with products or plans that are transformative are more likely to gain traction with Congress. "There is a desire for real strategic change," McBee said. A key to success in this competitive market, he said, "is not wasting people's time with ideas that are incremental." "Where the strike zone is is ideas that are mature, that are proven, that are bench-tested, but either capital or policy is needed to take it to scale," McBee added. "We are sort of actively seeking companies out that fit that bill." Because of the congressional desire for big ideas, he said, traditional lobbying tactics like seeking help from old friends do not necessarily work. "Great ideas transcend who it is you know, what it is your [political action committee] looks like," McBee said. Palo Alto, Calif.-based company Better Place is working to persuade Congress that it has one of those revolutionary ideas. The company wants to build an infrastructure for charging electric cars. But the idea requires a shift in how electric cars would be sold and recharged. New electric cars would be sold with exchangeable batteries, said Andy Davis, vice president of the clean energy team at McBee Strategic Consulting. Drivers would buy battery usage plans based on their driving amounts, similar to how cell phone plans work. They would use charging stations owned by Better Place. States and cities have shown interest in the company's concept. The business has an agreement with the Israeli government to build infrastructure there, Davis said. In the United States, Better Place and its lobbyists are working on giving lawmakers information about its plan. Moving from lab to marketplace Others seeking help on Capitol Hill say they have proven technologies that need help moving to commercial scale. PetroAlgae, a Melbourne, Fla.-based company, wants to build a demonstration plant to show that it can grow algae and turn it into oil. Such oil would not emit any carbon dioxide when processed and burned, said Patrick Von Bargen, director at lobbying firm Quinn Gillespie & Associates. Algae grows on a diet of carbon dioxide, Von Bargen said, which makes the technology especially useful as Congress pursues policies to lower the country's greenhouse gas emissions. The company, which has about 100 employees, hired Quinn Gillespie this month. PetroAlgae is seeking help applying for DOE grants created through the stimulus bill, Von Bargen said. The company also wants to make sure that future legislative definitions of biofuels are broad enough to include algae. A biofuel in general is fuel developed from plant material. "One of the critical things that policymakers need to do, they need to be technology neutral," Von Bargen said. MicroPlanet, a Seattle-based company that hired a lobbyist last October, wants help deploying a technology it says would help conserve power. Because the nation's electrical grid is inefficient, utilities send out more power than a customer actually needs to ensure that when the electricity reaches a home, it is at the required 114-volt level. Using products installed outside a customer's home, MicroPlanet's technology keeps the power that goes into the house at 114 volts, said Noah Reandeau, lobbyist with Gordon Thomas Honeywell Government Affairs. Any additional power above 114 volts stays on the electric line, he said. The technology has been deployed in nine countries, he said. In Washington, Reandeau said, "We're raising awareness of the fact that the technology exists." As Congress moves toward a national requirement that utilities produce some power from renewable sources, Reandeau said, MicroPlanet wants to make sure that lawmakers consider voltage regulation as an option for meeting the mandate. R&D assistance Some companies that have hired lobbyists are looking for research and development help. Lyman-Morse Boatbuilding, a Maine-based company, wants to use boat building technology to develop wind blades that could work on the Eastern Seaboard, where air currents can top 100 miles an hour. That requires a different kind of blade than one that works in Colorado or West Virginia, said Thomas Goldberg, the company's lobbyist. Because the blades are more than 200 feet long, he said, the tip of the blade would spin much faster than the hub. Blades need a redesign to ensure they do not tear apart in the East Coast environment, Goldberg said. "You have to have something that is significantly more robust," said Goldberg, who is with the American Technology Specialists lobbying firm. The company wants money for R&D. Tax credits that recently passed are not as helpful, Goldberg said, because no investment banks are lending for renewable projects. At the federal level, there is limited cash available and many businesses asking, Goldberg acknowledged. Members of Congress are asking sophisticated follow-up questions, such as requesting that a company provide more information on its product plan and assessments of its competitors' engineering designs. "The number of people who want to come forward and claim that they can do this is increasing," Goldberg said. "You make your case on the merits." Tracking bills, regulations Lobbyists also are representing companies that say they are ready to go commercially with energy products but need help tracking congressional and Obama administration regulatory moves. ADA Environmental Solutions, based in a Denver suburb, makes a product that reduces the mercury emitted by burning coal. The process uses activated carbon, similar to how water filters work, said President and CEO Mike Durham. The company, which hired a lobbyist this month, is building a $400 million plant in Louisiana. It wants to build five more in other cities to meet demand from coal plants because 16 states have passed mercury-control regulations, Durham said. "It's not a matter of if, it's a matter of when bills in Congress would require mercury control at all power plants," Durham said. In addition, Durham said, the company may want to compete for DOE grants for research on sequestering carbon dioxide emissions from coal-fired power plants. Cleaning coal of its greenhouse gas byproduct is a widely discussed idea but at this point unavailable at a commercial scale. "The country has to invest in the technology," Durham said, "if they want to rely on this very secure fuel and reduce carbon emissions."

## Plan Popular- Swing States

### Plan popular – swing state leaders generate buzz

Foust, ‘8 – Political tracker targeting space policy [Jeff, 9/16/2008, SpacePolitics, “A space solar power caucus in Congress?,” http://www.spacepolitics.com/2008/09/16/a-space-solar-power-caucus-in-congress/, DS]

At the end, though, a “special guest” spoke for a few minutes: Paul Rancatore. If the name sounds familiar, it’s because he ran on a very strongly pro-space platform for Congress in Florida’s 15th district, advocating space solar power, among other things, and winning the endorsement of Buzz Aldrin. However, he lost the Democratic primary in August. Currently, he’s spending time in Washington meeting with members of Congress and their staffs trying to promote space solar power. In his words, he’s trying to “educate members about what space-based solar power can do for our country, create that dialogue, and possible create a ‘space-based solar caucus’ within Congress for them to fully understand the ramifications for our country and the world and start get members involved.”

### Attracts swing state voters – revitalizes jobs in massive industries

Thompson 5/13 – Chief Operating Officer of Lexington Institute and former Deputy Director of the Security Studies Program at Georgetown University and former prof at Harvard’s Kennedy School of government [Loren B., Lexington Institute, “Obama Mis-Steps on Aerospace and Defense Could Lose election,” http://www.lexingtoninstitute.org/obama-mis-steps-on-aerospace--defense-could-lose-election?a=1&c=1171, DS]

The White House has decided not to comment on a looney complaint brought by the National Labor Relations Board that argues Boeing shouldn't be allowed to open an aircraft plant in South Carolina because building such a facility in a right-to-work state could undercut the bargaining position of labor unions in Washington State. It's an absurd argument that has reawakened every fear businessmen harbored about the president being a closet socialist. Speaking as an independent who voted for Obama in 2008 and expects to vote for him again, I'm embarrassed by the whole affair. But what really worries me is that if the White House keeps making bad calls on major aerospace and defense issues, the electoral fallout could destroy its re-election chances. Mr. Obama is by no means a shoo-in for reelection, because his election in 2008 was largely the result of a promise to end the unpopular war in Iraq and his approval ratings since being elected have seldom managed to rise above 50 percent. Personally, I think he made the right calls on bailing out Detroit and reforming healthcare. But he can't afford to offend any of the swing states that will probably decide the outcome of the 2012 election -- states like Florida, Iowa and Ohio -- and lately his subordinates seem to be working overtime to do just that. Take the National Labor Relations Board effort to block the opening of the aircraft plant in South Carolina. The NLRB is sure to lose if the case goes to a federal court, but in the meantime, thousands of people in South Carolina who might have secured good-paying jobs at the new Boeing plant will have to keep searching just because they live in a right-to-work state. Obama wasn't going to win South Carolina anyway, but how are people going to react to this crazy case in other right-to-work states like Arizona, Iowa and Virginia? Not by voting for the president. Why doesn't the White House just admit the NLRB made a mistake and drop the case? **Or take the administration's inept handling of NASA's human spaceflight program.** Thousands of NASA employees in the critical swing state of Florida are losing jobs because the Space Shuttle is retiring and the White House decided to cancel a successor program called Constellation. Voters in Florida's central region around Cape Kennedy hold the electoral balance of power between the state's conservative north and more progressive south, so wiping out thousands of jobs there with a poorly conceived plan to restructure the manned spaceflight program could kill Obama's prospects in the Sunshine State. Is it possible that White House political operatives don't recall how a few thousand votes in Florida delivered the White House to Bush in 2000? And then there's Ohio, the one state that candidates must carry to win the White House. I can't fault the administration on pushing to kill an extra engine for the F-35 fighter that would have been built in Ohio, because the engine was a total waste of money. But to also propose closing the nation's only tank plant, which is also located in Ohio, is just plain dumb -- dumb as a management strategy (the Army wants to reopen it three years later), dumb as a security policy (we need at least one warm production line for heavy armor), and dumb as an electoral move (Ohioans can't help noticing that they always seem to be in the cross-hairs of administration budget cutters). When is this White House going to wake up to the fact that the aerospace and defense industry is one of the last big concentrations of organized labor left in the private-sector economy -- an industry whose workers could provide the margin of victory in swing states like Colorado and Missouri and Pennsylvania and Virginia? I'm not saying the administration should be backing bad ideas just to win votes, but on NLRB, NASA and the tank plant, it is doing foolish things that alienate millions of voters. A few more mistakes like these and we could end up with Governor Christie as president in two years.

## AT: Spending is unpopular

### Congress won’t oppose spending if it helps the military

Merchant, ’10 - Freelance writer who covers climate/energy issues and politics for TreeHugger [Brian, 10/7/10, TreeHugger, “How the US Military Could Bring Solar Power to Mass Market,” http://www.treehugger.com/files/2010/10/us-military-solar-power-mass-market.php, DS]

Furthermore, Congress is infinitely more likely to approve funding for R&D and infrastructure if the projects are military-related. Which is depressing, but true -- the one thing that no politician can get caught opposing is the safety of American troops. In fact, the whole premise of the article is rather depressing, on point though it may be: The only way we may end up getting a competitive clean energy industry is through serious military investment, which is of course, serious government spending. Which under any other guise would be vehemently opposed by conservatives. So we can't pass legislation that would allegedly "pick winners and losers" by making polluters responsible for their emissions, in order to level the playing field for renewable energy in the marketplace. And we can't pass a law that would address global climate change, which is already causing hundreds of thousands (if not millions) to suffer around the world. But we can dump funding into clean energy R&D to ensure American dominance on the battlefield -- and perhaps the benefits of that investment will trickle down to American consumers, too.

## Plan Unpopular-General

### No political will – constant ignoring of SPS proves

Boswell, ‘4 – Space writer and contributor to Space Review [David, 8/30/2004, The Space Review, “Whatever happened to solar power satellites?,” http://www.thespacereview.com/article/214/1, DS]

There were over 60 launches in 2003, so last year there was enough money spent to put something into orbit about every week on average. Funding was found to launch science satellites to study gravity waves and to explore other planets. There are also dozens of GPS satellites in orbit that help people find out where they are on the ground. Is there enough money available for these purposes, but not enough to launch even one solar power satellite that would help the world develop a new source of energy? In the 2004 budget the Department of Energy has over $260 million allocated for fusion research. Obviously the government has some interest in funding renewable energy research and they realize that private companies would not be able to fund the development of a sustainable fusion industry on their own. From this perspective, the barrier holding back solar power satellites is not purely financial, but rather the problem is that **there is not enough political will to make the money available** for further development.

## Plan Unpopular- Fossil Fuel Lobby

### Congress won’t pass the plan – fossil fuel lobbies

Gartner, ‘4 - Writer for Wired [John, 6/22/2004, Wired, “NASA Spaces on Energy Solution,” http://www.wired.com/science/discoveries/news/2004/06/63913, DS]

Neville Marzwell, advanced concepts innovation technology manager at NASA, spent five years researching methods of improving a satellite's ability to collect solar energy before his program was cut. Marzwell claims that politics played a part in the decision to kill the space solar power program. The United States "doesn't have the political will to fund the research" because of pressure from fossil-fuel lobbyists, Marzwell said. "We could have become the Saudi Arabia of the world electricity market," Marzwell said. But because the coal and oil industries don't want threats to their profits, they applied political pressure, causing the program to be scrapped, according to Marzwell.

### They’re key to the agenda – past elections prove massive clout

Goldenberg, ’10 – US environment correspondent for the Guardian [Suzanne, 11/1/2010, The Guardian, “Big Oil spends $69.5m on ads to get the Congress it wants,” http://www.guardian.co.uk/environment/2010/nov/01/us-midterm-elections-2010-oil-lobby-climate-sceptic, DS]

The next Congress is expected to throw up a whole new set of roadblocks to Barack Obama's environmental agenda - from time-consuming investigations to budget cuts. So how much was the fossil fuel industries willing to pay to help cast out White House allies on energy and climate change? A lot, it turns out. Oil and coal lobby groups have spent $69.5 million on television ads specifically targetted against Obama clean energy policies in these mid-term elections, according to data compiled by the Center for American Progress Action Fund. That's a 10-to-1 advantage over clean energy groups. Opinion polls are all predicting big wins in tomorrow's elections for Republicans, especially Tea Party candidates. Most of the Tea Party favourites deny the existence of man-made climate change, and some Democrats, like Joe Manchin who is running for the Senate from West Virginia, are doing all they can to distance themselves from Democratic environmental policies. Manchin, in his television ads, fired a round into a target labelled cap-and-trade. The only bright spot could be California, where a coalition led by the outgoing Republican governor, Arnold Schwarzenegger, Silicon Valley and Venture Capital, have raised $30 million to defend the state's climate law from Texas oil refiners. Two Texas oil refiners, Valero and Tesoro, as well as a subsidiary owned by the billionaire Koch brothers mustered $10 million to block California's milestone climate change law, which mandates 25% cuts in emissions by 2020. The mid-term election ad buys were an expensive finish to what has been a big PR year overall for oil and coal. The energy industry spent $247.5 million on advertising this year, according to data compiled by the Alliance for Climate Protection, the campaigning group started by Al Gore. Much of that was dedicated to damage control. BP spent $125 million on its "We'll make this right" television ads after the catastrophic spill in the Gulf of Mexico. Massey Energy, owner of a West Virginia mine where 29 were killed in an explosion last April, spent $965,000 on advertising.

## \*\*\*NASA Trade-Off\*\*\*

## N/U Cuts Now

### Alt causes to the internal link – science cuts across the board should trigger the impact

Fox News 7/16 [7/16/11, " US Science Community Suffers Setbacks Despite Obama's Push for More Investing ", http://www.foxnews.com/politics/2011/07/16/us-science-community-suffers-setbacks-despite-obamas-push-for-more-investing/, DS]

As President Obama pushes for more spending on science education and research to keep America globally competitive, the nation’s scientific community continues to suffer a number of setbacks that appears to undermine the president’s goal. The U.S. is abandoning its space shuttle program, closing the Tevatron, considering defunding the James Webb Space Scope (Hubble’s replacement) and could possibly reject a cutting-edge underground research lab that would restore some prestige to the field of U.S. science. More than 140 scientific societies and universities sent a letter this week warning U.S. policymakers not to target specific science research programs in their negotiations to cut government spending in exchange for raising the debt limit. “Everyone understands that legislators face tremendous challenges related to the deficit and the national economy,” said Joanne Carney, director of the Office of Government Relations at the American Association for the Advancement of Science. “But recently, selected research areas have been unfairly trivialized based on misinformation intended to challenge the scientific review process.” In the letter, the group warned that cutting support for key fields of research “could have a chilling effect on scientists and young people considering a future in science.” The group argued that social, behavioral and economic research sheds light on U.S. demographic trends, criminal behaviors, decision-making processes crucial to military and national security operations, among other things. “Simply put, we need all scientists and scientific disciplines working -- alone and together -- to advance our knowledge base,” the group said. “Allocating federal investments competitively through scientific merit review is the very process that has led this country to be a world leader in science.” But the past few months have been filled with setbacks for science advocates.  Earlier this month, NASA launched its final space shuttle mission after its 30-year program ended, leaving Russia’s space capsules as the sole option for astronauts heading to and from the International Space Station.  The U.S. Energy Department announced earlier this year that it was shutting down by the end of September the Tevatron, the nation’s largest particle accelerator located outside of Chicago, because the agency could no longer count on the annual $35 million to keep it running until 2014.  Late last year, the oversight board of the National Science Foundation dropped out of a planned $875-million underground science lab in South Dakota, leaving the future of the Deep Underground Science and Engineering Laboratory (DUSEL) in doubt. The National Science Board rejected requests from the lab’s designers for more money after burning through the $19 million allocated. And the board didn’t like its proposed role in the project that would have made the foundation part of a stewardship program to run the lab.  Last week, the House Appropriations Committee released its funding bill for Commerce, Justice and Science for the next fiscal year that begins Oct. 1. The bill eliminates funding for the James Webb Space Telescope, NASA’s next-generation space telescope which would be the successor to Hubble and is the space agency’s biggest post-shuttle project. The committee says the project is billions of dollars over budget and plagued by poor management. “This legislation includes funding for some of the most critical aspects of government,” House Appropriations Chairman Hal Rogers said in a statement. “However, given this time of fiscal crisis, it is also important that Congress make tough decisions to cut programs where necessary to give priority to programs with broad national reach that have the most benefit to the American people.”

## Link N/U

### Link’s non-unique – plutonium should trigger the link

Foust 6/15 – freelance writer who runs Space Politics [Jeff, 6/15/2011, Space Politics, ‘Another push for Pu-238 funding,” http://www.spacepolitics.com/2011/06/15/another-push-for-pu-238-funding/, DS]

Plutonium 238 (Pu-238), the radioactive isotope used in the radioisotope thermoelectric generators (RTGs), is essential to a number of spacecraft missions, particularly those bound for the outer solar system. However, getting the relatively modest funding (no more than a few tens of millions of dollars a year) needed to restart Pu-238 production in the US to ensure that a supply of the isotope is available for future missions has been difficult in recent years. The latest push is taking place this week. The Obama Administration included $10 million each for NASA and the Department of Energy (DOE) to restart Pu-238 production, but a draft version of the Energy and Water appropriations bill in the House does not include that funding. The full House Appropriations Committee is scheduled to markup the bill in a hearing today. Emily Lakdawalla of The Planetary Society reported yesterday that the American Geophysical Union (AGU) is making a last-minute push to get the money added to the appropriations bill. In an email, the AGU said that Rep. Adam Schiff (D-CA), whose district includes JPL, plans to introduce an amendment to the bill to include the Pu-238 funding. (The AGU alert is not included in its list of “Science Policy Alerts” on its web site; it apparently went out to AGU members whose representatives are on the committee.) The AGU asked its members to contact their congressmen and ask them to support the Schiff amendment, providing a variety of talking points to use in those calls.

## No Trade-off Link

### No trade-offs – empirics prove

Landis, ‘95 [Geoffrey, NASA John Glenn Research Center, “ Footsteps to Mars: An incremental approach to Mars exploration,” Journal of the British Interplanetary Society, Vol. 48, pp. 367-342 (1995); http://www.geoffreylandis.com/Footsteps.pdf]

Recently there has been an alarming tendency in the scientific and space advocacy communities for advocates to attack one project, in the belief that if that project could be canceled, the money saved would be used for their own, more desirable projects. This is false. Quoting from senate staffer Steve Palmer [17]: “What space station and ASRM [advanced solid rocket motor] add up to is a drop in the bucket. If Congress cuts out both space station and ASRM, will the money be used for other programs of interest to the space industry? The short answer is no”. Arguments to cancel space projects are eagerly picked up in Congress, by people who have agendas and pet projects that have nothing to do with space. Further, attacking space projects has the result of making enemies out of allies. When we attack someone else’s project, we can count on having them attack ours. The result is that the arguments against both projects will be remembered by a money-starved Congress. It is not true that manned missions eclipse funds for unmanned science missions. In fact, there is an excellent case to be made for precisely the opposite correlation: the presence of large manned missions increases the funding and opportunities for unmanned science missions. Historically, the science budget of NASA has been a roughly constant fraction of the total budget; any major new initiative which increases the overall space budget is likely to increase the funding for science. If Mars advocates adopt the approach of pushing our initiatives by tearing down other space programs, the likely result is that nothing, neither Mars nor other programs, will be accomplished.

### NASA’s budget isn’t set – deliberation process means no tradeoff

Chow 7/12 – writer for Space.com[Denise, Space.com, 7/12/11, "Scientists Condemn Plans to Scrap Hubble Telescope Successor ", http://www.space.com/12245-james-webb-telescope-cancellation-scientist-reactions.html, DS]

"We still have a long way to go with budget deliberations for Fiscal Year 2012," NASA spokesman Dwayne Brown said in a statement from the agency's headquarters in Washington, D.C. "NASA's budget submission already reflects tough decisions required in these difficult fiscal times and it still supports every element of the president's vision and the bipartisan NASA Authorization Act of 2010. We look forward to working with both houses of Congress to ensure we have a robust space exploration program and narrow America’s human space flight gap."

### NASA’s budget isn’t set – has to pass the House and Senate, who love space

Ropp 7/10 – Staff writer at the Huntsville Times (Lee, 7/10/11, “NASA celebrates triumph as Congress takes first step to cut its funding ", http://blog.al.com/space-news/2011/07/nasa\_celebrates\_triumph\_as\_con.html, DS)

[NOTE: Citing US Rep. Mo Brooks, R-Huntsville]

There are no more shuttles to fly, which means lower costs to NASA, Brooks pointed out. And this was just a subcommittee vote. The full appropriations committee must pass this cut, and so does the full House. Whatever passes must pass the Senate, too, and the Senate is a bastion of NASA support that forced the White House to compromise and agree to the new rocket last year.

### SBSP won’t be within NASA’s jurisdiction – won’t trade off

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

FINDING: The SBSP Study Group found that SBSP development over the past 30 years has made little progress because it “falls between the cracks” of currently‐defined responsibilities of federal bureaucracies, and has lacked an organizational advocate within the US Government. The current bureaucratic lanes are drawn in such a way to exclude the likelihood of SBSP development. NASA’s charter and focus is clearly on robotic and human exploration to execute the Moon‐Mars Vision for Space Exploration, and is cognizant that it is not America’s Department of Energy (DOE). DOE rightly recognizes that the hard challenges to SBSP all lie in spacefaring activities such as space access, and space‐to‐Earth power‐beaming, none of which are its core competencies, and would make it dependent upon a space‐capable agency. The Office of Space Commercialization in the Department of Commerce is not sufficiently resourced for this mission, and no dedicated Space Development Agency exists as of yet. DoD has much of the necessary development expertise in‐house, and clearly has a responsibility to look to the long term security of the United States, but it is also not the country’s Department of Energy, and must focus itself on war prevention and warfighting concerns.

### Won’t trade off – budget internally flexible

Moskowitz 4/15 - senior writer at Space [Clara, 4/15/2011, SPACE, “NASA’s 2011 Budget Should Allow Flexibility Despite Cuts,” http://www.space.com/11411-nasa-2011-budget-cuts-constellation-funding.html, DS]

A new federal spending bill represents a cut to NASA's funding, but a lessening of restrictions on how the agency spends that money for the rest of this year. The new measure is a political compromise between democrats and republicans, and includes significant spending cuts in the 2011 federal budget. NASA will have to make do with about $18.5 billion, putting its budget roughly $240 million below last year's funding level. NASA and the rest of the federal government had been in limbo while lawmakers haggled over the budget. But on Thursday (April 14), Congress passed a spending measure called a continuing resolution that will cover the last five months of the year 2011. The new budget compromise followed a series of stopgap measures Congress had used to fund the government in lieu of agreeing on an official fiscal year 2011 budget. Experts said NASA will likely be able to accomplish most of the plans on the table under the new bill. "NASA will be able to do what it has to do until the next budget," space policy expert Roger Handberg, a political science professor at the University of Central Florida, told SPACE.com. "NASA has been survival mode since last fall when the first continuing resolution was put in place." The new budget at least frees NASA from a stifling provision under its 2010 budget that prevented it from cutting funding to the moon-bound Constellation program. Yet that program was canceled by President Barack Obama in early 2010, and NASA has been targeting new goals ever since. [NASA's Shuttle Program in Pictures] Now the space agency will finally be free to stop spending money on canceled Constellation projects. "The elimination of the Constellation provision will free up resources otherwise committed," Handberg said, saving NASA some of the money that it loses in the reduction of its annual budget. NASA leaders expressed gratitude that the agency can now move forward fully toward its new direction. "This bill lifts funding restrictions **that limited our flexibility** to carry out our shared vision for the future," NASA administrator Charles Bolden said in a statement. "With this funding, we will continue to aggressively develop a new heavy lift rocket, multipurpose crew vehicle and commercial capability to transport our astronauts and their supplies on American-made and launched spacecraft." Overall, Bolden admitted the need for spending cuts, and was optimistic that the agency would be able to do a lot with what it's given. "We are committed to living within our means in these tough fiscal times - and we are committed to carrying out our ambitious new plans for exploration and discovery," Bolden said.

## Cut Webb Telescope instead

### Earth science won’t be cut – the James Webb telescope’s on the chopping block and could free up funds

Pachal 7/14 – PCMag News Director [Peter, 7/14/2011, PCMag, “Congress Comes Closer to Killing NASA’s James Webb Telescope,” http://www.pcmag.com/article2/0,2817,2388502,00.asp, DS]

The James Webb space telescope, the successor to Hubble, just came one step closer to being thrown in the trash bin over budget cuts. Yesterday the House Committee on Appropriations approved a plan to slash NASA's budget for next year and explicitly kill the project. The House and Senate still need to vote on the measure before it becomes law, but it's not looking good for expensive Webb. The cost of developing the telescope has ballooned over the years as NASA has had to invent whole new technologies in order to make it work properly. Unlike the Hubble, the Webb will be much further from Earth in order to shield itself from infrared radiation, and its systems will need to function at extremely cold temperatures. Adapting to those conditions has proved pricey for NASA. It's already spent $3 billion on the Webb, and the total cost is projected to be about $6.8 billion (it was initially budgeted at $1.6 billion total). However, once launched and put into place, the Webb will be so far from Earth that it will be impossible to service, so subsequent costs would involve only operating the telescope and analyzing its data (estimated at $1 billion over 10 years). On Tuesday, NASA Administrator Charles Bolden made an appeal to the House Science, Space, and Technology Committee to save the Webb. "I have tried to explain what I think is the importance of James Webb, in terms of opening new horizons far greater than we got from Hubble," Discovery News reported Bolden as saying. "I would only say that for about the same cost as Hubble in real-year dollars, we'll bring James Webb into operation." His words apparently had little effect. Neither did an attempt to restore partial funding of the Webb with a eleventh-hour amendment from Rep. Adam Schiff, a Democrat from California. The Republican-dominated committee shot down the measure with a voice vote, Nature reported.

### James Webb would solve the link – more evidence

Discover Magazine 7/7 [Discover Magazine, 7/7/2011, “Congress puts NASA and JWST on the chopping block,” http://blogs.discovermagazine.com/badastronomy/2011/07/07/congress-puts-nasa-and-jwst-on-the-chopping-block/, DS]

But NASA is the one where the cuts are nothing short of savage. The cuts total $1.64 billion from last year, which is nearly $2 billion less than requested. That’s a cut of 8.8%. A billion of that is due to the Shuttle retiring, but the galling part is that the House is requiring that all funding for the James Webb Space Telescope, Hubble’s successor, be cut entirely. In other words, they are canceling the JWST program. To be fair, the JWST project has been over budget, behind schedule, and mismanaged for years. It’s sapped money away from other projects as well. But the reason this is so aggravating is that despite all that the pieces are built and currently being assembled. I’m not sure it’s cost-effective to cancel it at this point; better to put a hold on it, audit the whole thing top to bottom, and re-organize as needed.

## AT: Earth Science Impact

### Uniqueness overwhelms the internal link – earth sciences will focus on climate change regardless of the plan

Space Ref 7/15 (Space Ref, 7/15/2011, "AIP Number 90: FY 2012 House Funding Bill: NASA ", http://www.spaceref.com/news/viewsr.html?pid=37728, DS)

The full text of the committee report follows: "Earth Science missions. - The Committee recommendation includes a reduction of $100,000,000 below the request for Earth Science activities. While the Committee supports Earth Science functions, this area has rapidly grown over the past few fiscal years, and the current constrained fiscal environment simply cannot sustain the spending patterns envisioned by NASA in this field. The Committee has not included detailed, line-item reductions within the Earth Science portfolio. Instead, NASA should propose such reductions as part of the spending plan required by section 537 of this Act. "In proposing reductions, NASA should take care to protect, to the extent possible, high priority missions of the Earth Science decadal survey, including Ice, Cloud, and land Elevation Satellite-2, the Soil Moisture Active-Passive mission, and the Deformation, Ecosystem Structure and Dynamics of Ice mission, as well as missions with near-term launch readiness dates. In addition, NASA should be careful to propose a funding portfolio that maintains an essential balance between actual spaceflight projects and the critical mission-enabling activities (research and data analysis, data application, etc.) that support and enhance the value of those projects.

## \*\*\*AT: Launches/Debris\*\*\*

## N/U Launches now

### Nonunique – launches inevitable

### China

Richburg 7/5 (Keith, staff writer for the Washington Post, “As US halts space shuttle, others continue with launches and exploration,” Washington Post, 7/5/11. <http://www.washingtonpost.com/national/health-science/as-us-halts-space-shuttle-others-continue-with-launches-and-exploration/2011/06/27/gHQAmKe2yH\_story.html>)

After struggling in space for several years, experts said China this year appears poised for several significant breakthroughs that could cement its place as a leader in space exploration. Last October, China launched a robotic probe, the Chang’e 2 lunar orbiter, which completed its six months’ worth of tasks this spring. Because it still had fuel in reserve, the craft left its moon orbit last month for further exploration in space. This summer, China is scheduled to launch an unmanned space module, called Tiangong 1, or Heavenly Palace, and later this year will send up another unmanned vehicle, Shenzhou, which will try to dock with it. These will be crucial first steps in China’s goal to develop a manned space station.

### Commercial Launches

Clark 7/13 (Stephen, columnist for SpaceFlight Now, “Soyuz Rocket Launch beefs up Globalstar Satellite Fleet,” Spaceflight Now, 7/13/11. <http://www.spaceflightnow.com/news/n1107/13soyuzglobalstar/>)

Six fresh spacecraft for Globalstar's mobile communications satellite fleet were deployed Wednesday by a Russian Soyuz rocket, propping up the company's degraded two-way voice service for more than 400,000 subscribers around the world. The Soyuz rocket launched at 8:27 a.m. local time from the Baikonur Cosmodrome in Kazakhstan. Credit: Roscosmos The successful launch continued Globalstar's campaign to replace aging satellites launched more than a decade ago. The satellites, each weighing 1,543 pounds at launch, will enter Globalstar's constellation circling a few hundred miles above Earth. Thales Alenia Space assembled the satellites in Rome and built their communications equipment in Toulouse, France. U.S.-based Globalstar Inc. provides mobile satellite telephone and data transmission services to customers in more than 120 countries. The Soyuz 2-1a rocket launched at 0227 GMT Wednesday (10:27 p.m. EDT Tuesday) from the Baikonur Cosmodrome in Kazakhstan, where it was 8:27 a.m. local time. After soaring into a cloudless blue sky, the Soyuz rocket's three core stages accelerated the six satellites to nearly orbital velocity, then a Fregat upper stage took over for two firings to inject the payloads at the correct altitude. The mission featured an upgraded version of the Soyuz booster including a digital control system, which allows the rocket to fly a larger 13.4-foot-diameter nose conse for commercial flights. The Fregat stage finished deploying the six Globalstar spacecraft as programmed at 0427 GMT (12:07 a.m. EDT). Two satellites mounted on top of the specially-built dispenser separated first, followed by the four other craft moments later. "The report from the satellite operations center is that all the satellites have been acquired," said Jean-Yves Le Gall, chairman and CEO of Arianespace, which managed the commercial launch through Starsem, a subsidiary jointly owned by European and Russian companies. The Soyuz rocket and Fregat upper stage placed the satellites in a 572-mile-high orbit with an inclination of 52 degrees. "I'm very proud to share this great achievement with all of you," Le Gall said in a post-launch statement. "This success was made possible thanks to the venerable Soyuz launch vehicle, whose flawless performance enabled this launch." The launch was delayed two days after the countdown was halted seconds before liftoff Monday night. One of the launch pad's umbilical arms failed to retract, but workers repaired the system in time for launch two days later. One of the satellites orbited Wednesday will immediately raise its orbit to an altitude of 878 miles and join Globalstar's operational fleet within 30 days of launch. The other five satellites will remain at their current altitude until they drift to their planned position within the company's constellation. Globalstar satellites are divided among eight orbital planes to evenly spread the spacecraft across the globe. The Soyuz rocket's blastoff was timed to reach one of the orbital planes, where one of the satellites will enter service while the others drift to their ultimate locations. All six satellites will be in service within three-to-five months, according to Tony Navarra, Globalstar's president of global operations. Six other second-generation Globalstar satellites launched in October 2010 are now operational, Navarra said. Artist's concept of the second-generation Globalstar satellites. Credit: Thales Alenia Space One of the craft had to switch to a backup momentum wheel, triggering inspections of the next set of satellites, including a repair that caused a delay in the launch from the spring. The momentum wheel controls the satellite's orientation in space. Globalstar officials say the transition to the new satellite fleet will be seamless for the company's subscribers, except for a marked improvement in mobile two-way communications service. S-band antenna degradation on Globalstar's existing satellites has limited voice and duplex data communications since 2007. The problem has not affected Globalstar's simplex data relay and asset tracking product, according to the company. "We look forward to successfully orbit-raising these satellites so they can start improving the quality of our service, joining the rest of the six satellites from the previous launch in October and our first-generation satellites," said Vijaya Gallagher, the Globalstar 2 program manager. "We will start seeing immediate improvements in the duplex quality as well as simplex services for our existing customers as well as add new services very quickly." Globalstar subscribers use the satellite network to make mobile phone calls and data transmissions, especially in rural zones where terrestrial coverage is spotty or non-existent. Globalstar's existing constellation is mostly comprised of spacecraft launched between 1998 and 2000. Built by Space Systems/Loral and designed for a seven-and-a-half year orbital life, the satellites are aging and need to be replaced. Controllers are retiring the old satellites as fresh spacecraft enter service. The new satellites have a design life of 15 years. According to Navarra, two more Soyuz flights with six Globalstar satellites each are scheduled before the end of 2011. When the launch campaign is finished at the end of the year, Globalstar's satellite fleet will include 24 second-generation spacecraft and eight leftover first-generation satellites built as spares and launched in 2007.

### Space Tourism

Minard 9 (Anne, National Geographic Researcher, 4/14/09, “Rocket Launches Damage Ozone Layer, Study Says,” National Geographic News, http://news.nationalgeographic.com/news/2009/04/090414-rockets-ozone.html)

Increased international space launches and the potential commercial space travel boom could mean that rockets will **soon emerge** as the **worst offenders** in terms of ozone depletion, according to the study, published in the March issue of the journal Astropolitics. If the space tourism industry alone follows market projections, rocket launches are "going to run up against Montreal Protocol," said study co-author Darin Toohey of the University of Colorado at Boulder. The Montreal Protocol on Substances that Deplete the Ozone Layer, an international treaty, prescribes measures intended to hasten the recovery of Earth's depleted ozone layer.

### Russia

Englund 7/5 (Will, staff writer for the Washington Post, “As US halts space shuttle, others continue with launches and exploration,” Washington Post, 7/5/11. <http://www.washingtonpost.com/national/health-science/as-us-halts-space-shuttle-others-continue-with-launches-and-exploration/2011/06/27/gHQAmKe2yH\_story.html>)

The Russian space program, which suffered in the 1990s — remember the Mir space station, which was killed off in 2001 and allowed to fall into the sea? — is more robust today. But with a budget of about $3 billion, it still suffers from an aging workforce and struggles to hire talented staff. An ambitious plan to build a new launch center in eastern Siberia (Russia currently uses the Baikonur site, in Kazakhstan) and introduce a new line of rockets and a new spacecraft by 2018 looks as though it may be delayed. Russia is also working on developing a reusable rocket, which it believes would make it the leader in space for the next 50 years. Some Russian scientists believe that spaceflight can’t advance much further without new means of propulsion, most likely from nuclear-powered engines. Russia has always emphasized manned flight but is currently putting a satellite system in place to rival the GPS system.

### India

Lakshmi 7/5 (Rama, staff writer for the Washington Post, “As US halts space shuttle, others continue with launches and exploration,” Washington Post, 7/5/11. <http://www.washingtonpost.com/national/health-science/as-us-halts-space-shuttle-others-continue-with-launches-and-exploration/2011/06/27/gHQAmKe2yH\_story.html>)

In 2008, India launched its first unmanned moon mission, Chandrayaan-1, which catapulted the country into the big league. Spurred by China’s growing space ambitions, India has focused on launching its first manned space mission in 2016. India’s space program was dealt a setback in December, when a rocket carrying a communications satellite exploded soon after liftoff. This was India’s second launch failure in 2010. In addition to its dream of a manned mission to the moon, India is planning an unmanned lunar mission, Chandrayaan-2, in 2013 with collaboration from the Russian space agency. This will pick up samples of soil and rocks for chemical analysis

## N/U Collisions now

### Nonunique – collisions already happening

### Russia

Imburgia 11 (Joseph S. – Lt. Col. and Judge Advocate in Air Force, legal exchange officer to the Directorate of Operations and International Law, Defence Legal, Australian Defence Force, Canberra, Australia, 2011, “Space Debris and Its Threat to National Security: A Proposal for a Binding International Agreement to Clean Up the Junk,” Vanderbilt Journal of Transnational Affairs, <findarticles.com/p/articles/mi\_hb3577/is\_3\_44/ai\_n57583169/>)

Unfortunately, the space debris problem is not limited to near misses. On February 10, 2009, five hundred miles above Siberia, a Russian communications satellite collided with a privately owned Iridium telecommunications satellite “in an unprecedented orbital accident that would have been visible from the Earth.”35 If defunct, the Russian satellite would be properly considered “space debris”36

### Europe

Imburgia 11 (Joseph S. – Lt. Col. and Judge Advocate in Air Force, legal exchange officer to the Directorate of Operations and International Law, Defence Legal, Australian Defence Force, Canberra, Australia, 2011, “Space Debris and Its Threat to National Security: A Proposal for a Binding International Agreement to Clean Up the Junk,” Vanderbilt Journal of Transnational Affairs, <findarticles.com/p/articles/mi\_hb3577/is\_3\_44/ai\_n57583169/>)

Other space debris collisions have also occurred. For example, in 1986 the third stage of an Arianne rocket, launched by the European Space Agency, exploded in outer space, “generating over 700 fist-sized debris fragments.”42 In 1996, ten years after that Arianne rocket exploded, debris from its explosion struck the French reconnaissance satellite Cerise43 and severed its stabilization boom.

### US

Imburgia 11 (Joseph S. – Lt. Col. and Judge Advocate in Air Force, legal exchange officer to the Directorate of Operations and International Law, Defence Legal, Australian Defence Force, Canberra, Australia, 2011, “Space Debris and Its Threat to National Security: A Proposal for a Binding International Agreement to Clean Up the Junk,” Vanderbilt Journal of Transnational Affairs, <findarticles.com/p/articles/mi\_hb3577/is\_3\_44/ai\_n57583169/>)

Another space debris collision occurred in 2005, when pieces from a U.S. rocket, used to launch a satellite in 1974, collided with debris from a Chinese launch vehicle that exploded in space in 2000. 46 The collision produced three new marble-sized pieces of debris.

## N/U Cascade Now

### Nonunique – cascade inevitable

### ASAT tests

Broad 7 (William, columnist for the New York Times, “Orbiting Junk, Once a Nuisance, Is Now a Threat,” New York Times, 2/6/07. <http://www.nytimes.com/2007/02/06/science/space/06orbi.html?pagewanted=2>)

In the last decade or so, as scientists came to agree that the number of objects in orbit had surpassed a critical mass — or, in their terms, the critical spatial density, the point at which a chain reaction becomes inevitable — they grew more anxious. Early this year, after a half-century of growth, the federal list of detectable objects (four inches wide or larger) reached 10,000, including dead satellites, spent rocket stages, a camera, a hand tool and junkyards of whirling debris left over from chance explosions and destructive tests. Now, experts say, China’s test on Jan. 11 of an antisatellite rocket that shattered an old satellite into hundreds of large fragments means the chain reaction will most likely start sooner. If their predictions are right, the cascade could put billions of dollars’ worth of advanced satellites at risk and eventually threaten to limit humanity’s reach for the stars.

### Only removal solves

Imburgia 11 (Joseph S. – Lt. Col. and Judge Advocate in Air Force, legal exchange officer to the Directorate of Operations and International Law, Defence Legal, Australian Defence Force, Canberra, Australia, 2011, “Space Debris and Its Threat to National Security: A Proposal for a Binding International Agreement to Clean Up the Junk,” Vanderbilt Journal of Transnational Affairs, <findarticles.com/p/articles/mi\_hb3577/is\_3\_44/ai\_n57583169/>)

“Today, next year or next decade, some piece of whirling debris will start the cascade, experts say.”63 According to Nicholas L. Johnson, NASA’s chief scientist for orbital debris, the cascade is now “inevitable” unless something is done to remove the debris. 64 Experts believe that if nothing is done to address the space debris problem, the amount of orbiting space debris greater than ten centimeters in size will increase to over 50,000 objects in the next fifty years. 65

## Link turn- SBSP solves

### SBSP tech solves debris -

### Beaming

Grey 2k (Jerry, Director of Aerospace and Science Policy at the American Institute of Aeronautics and Astronautics, “Testimony of Jerry Grey before House Science Committee Hearings on Solar Power Satellites,” US House of Representatives Archives, September 7, 2000. <http://www.nss.org/settlement/ssp/library/2000-testimony-JerryGrey.htm>)

The AIAA assessment suggested a number of opportunities for multiple-use of the SSP-enabling technologies in terrestrial and space endeavors Of these, the following high-priority areas were identified: (1) Human space exploration. (a) Power systems for the Martian surface. If nuclear systems turn out not be available for use, large photovoltaic arrays in the 100 - 200 kWe range, coupled with wireless power transmission (WPT), become highly promising. These solar power systems are especially attractive if they can be combined with an Earth-Mars transportation system using solar-electric propulsion (SEP). (b) In-space transportation. SEP is generally considered a viable alternative to nuclear thermal propulsion for human Mars exploration. (c) Beamed power. WPT could be used for mobile extraction systems deployed in permanently-shadowed cold traps at the lunar poles and for in-situ resource utilization at various locations on Mars. Other applications include beamed power to communications and information-gathering stations on planetary surfaces or in orbit; e.g., high-power radar mappers; mobile robotic systems; remote sensing stations; dispersed habitation modules; human-occupied field stations; and supplementary power to surface solar power systems during periods when they are shadowed. (2) Science and robotic space exploration (a) Multi-asteroid sample return. Visit a significant number of belt asteroids in a 2-5 year period, collecting samples for return to Earth. (b) Asteroid/comet analysis. Determine the chemical content of comets and asteroids on rendezvous missions (enabled by solar-electric propulsion) by using deep-penetration imaging radar and by beaming laser and/or microwave power down to the surface to vaporize material for spectrographic analysis. (c) Orbital debris removal. Use beamed energy to rendezvous and grapple with a piece of space junk. Space-based lasers could also be used to vaporize smaller debris or to redirect the orbits of larger pieces to atmospheric reentry trajectories.

### Satellites

Grey 2k (Jerry, Director of Aerospace and Science Policy at the American Institute of Aeronautics and Astronautics, “Testimony of Jerry Grey before House Science Committee Hearings on Solar Power Satellites,” US House of Representatives Archives, September 7, 2000. <http://www.nss.org/settlement/ssp/library/2000-testimony-JerryGrey.htm>)

From among these multiple-use opportunities, the AIAA assessment selected the following prospects for near-term demonstrations: (1) System flight demonstration. Use a solar array mounted in the Shuttle's payload bay to demonstrate power transmission to nearby (co-orbiting) targets. (2) Tether demonstration. Use the Shuttle to demonstrate a static tether by releasing a mass to a higher orbit (tether up) and releasing a mass to de-orbit it (tether down). (3) Robotic operations. Use robot platforms to demonstrate end-to-end transport of cargo and installation on the international space station. (4) Ground power conversion comparison. Demonstrate WPT using threeadjacent ground-based power systems employing (a) ground-based photovolaic arrays, (b) ground-based arrays supplemented by laser power at approximately one-sun brightness, and (c) ground-based arrays supplemented by microwave power. (5) Combined power/communications systems. Demonstrate microwave power transmission containing high data-rate information. (6) Power beaming to aerial platforms. Use magnetron directional amplifiers to transmit power to aircraft and/or airships for telecommunications, observation, and stratospheric/tropospheric science demonstrations. (7) High-power Mars-orbiting communication relay satellite. Demonstrate SSP technologies aboard a Mars-orbiting high-power communications satelliterelaying Mars probe information directly to Earth at very high data rates. (8) Orbital debris removal Maneuver a Shuttle-based or ISS-based small satellite, using beamed energy, to rendezvous and grapple with a piece of space junk and lower its orbit.

## AT: Debris turns the case

### Doesn’t turn case – SBSP won’t get hit by debris

Powersat 11 (Powersat, SBSP research and development facility, “About Space Solar Power,” <http://www.powersat.com/faq.html>)

Collision with space junk is unlikely for a number of reasons. First, PowerSat reside in a geosynchronous orbit which is much higher than the low earth orbit debris band. Second, the surface area of the powersat is thin-film solar cells. Thus, a piece of space junk would go right through the thin film and would affect only a fraction of the output of that module, as there are many solar cells within a module. We could conceivably lose a module if a piece of junk collided with the core control system for that module, but the output of one module is only 1/300th the output of the entire satellite and can be easily replaced.

### SBSP not susceptible to debris damage

Grey 2k (Jerry, Director of Aerospace and Science Policy at the American Institute of Aeronautics and Astronautics, “Testimony of Jerry Grey before House Science Committee Hearings on Solar Power Satellites,” US House of Representatives Archives, September 7, 2000. <http://www.nss.org/settlement/ssp/library/2000-testimony-JerryGrey.htm>)

Although the SSP configurations are large, their diaphanous nature and location in geostationary or geosynchronous halo orbits imply low susceptibility to serious damage by either natural or anthropogenic orbital debris. Moreover, since all the proposed concepts employ robotic inspection and maintenance, repairs of any such damage should be able to be accomplished.

## AT: Launches bad-Ozone

### Launches don’t kill ozone – only a 0.04 percent decrease for all past rockets combined

Ross and Zittel 2k (Martin – leader of the Environmental Systems Directorate at Aerospace on research on the stratospheric impact of launch vehicles and Paul – leads the Remote Sensing Department at Aerospace on the radiative and chemical properties of rocket plumes, “Rockets and the Ozone Layer,” Aerospace Publications, Summer 2000. <http://www.aero.org/publications/crosslink/summer2000/01.html>)

Space transportation, once dominated by government, has become an important part of our commercial economy, and the business of launching payloads into orbit is expected to nearly double in the next decade. Each time a rocket is launched, combustion products are emitted into the stratosphere. CFCs and other chemicals banned by international agreement are thought to have reduced the total amount of stratospheric ozone by about 4 percent. In comparison, recent predictions about the effect on the ozone layer of solid rocket motor (SRM) emissions suggest that they reduce the total amount of stratospheric ozone by only about 0.04 percent. Even though emissions from liquid-fueled rocket engines were not included in these predictions, it is likely that rockets do not constitute a serious threat to global stratospheric ozone at the present time.

## SBSP solves Satellite Operability

### [If you’re reading the radar scenario for Heg then this is the 1AC Ramos card – you can just extend it]

### SBSP solves satellites -

### Maneuverability – keeps satellites safe from debris

Ramos 2k (Kim, USAF Major and professor at the Air Command and Staff College Air University, “Solar Power Constellations Implications for the US Air Force.” April 2000. <https://www.afresearch.org/skins/rims/q\_mod\_be0e99f3-fc56-4ccb-8dfe-670c0822a153/q\_act\_downloadpaper/q\_obj\_73510976-ad5e-4d5d-a51c-a7103406f67d/display.aspx?rs=enginespage>)

Powering small satellites with energy beamed from a solar power satellite further reduces their size, cost, and launch requirements. Maneuver One of the vulnerabilities of satellites is that they lack maneuverability. Orbit changes are possible but the amount of station keeping fuel limits these maneuvers. Unscheduled orbital maneuvers for, supported warfighters, on-orbit station keeping, or avoiding an anti-satellite weapon, reduce the life expectancy of satellites. The New World Vistas study concluded, “technologies to substantially enhance survivability are …maneuvering technologies…enabled by the technologies of high generation power in space.” 25 Moreover, the report stated that electrical propulsion and solar power satellites would enable maneuvering for survivability, station keeping, and repositioning to meet warfighter requirements.

### Reconstitution – UAVs and relaunch stand in for lost satellites

Ramos 2k (Kim, USAF Major and professor at the Air Command and Staff College Air University, “Solar Power Constellations Implications for the US Air Force.” April 2000. <https://www.afresearch.org/skins/rims/q\_mod\_be0e99f3-fc56-4ccb-8dfe-670c0822a153/q\_act\_downloadpaper/q\_obj\_73510976-ad5e-4d5d-a51c-a7103406f67d/display.aspx?rs=enginespage>)

As outlined in Air University study Spacecast 2020, the rapid launch and deployment of satellites is required to comply with the United States National Military Strategy concept of reconstitution. Reconstitution for space is the ability to launch satellites for “unanticipated system failures … [due to hostile actions] and multiple area coverage requirements, [which] … require the immediate placement of satellites into orbit.” 21 Solar power satellites enable reconstitution with unmanned aerial vehicles performing the same functions as satellites, as mentioned previously, and through enabling smaller satellites. One of the difficulties in achieving small satellites is the fact that power generation takes up about 25% of the weight of a satellite. 22 Satellites launched without onboard power generation would be smaller and receive power on orbit from a solar power satellite.

### The USFG has backup - eLORAN

Pappalardo 9 (Joe, columnist for Popular Mechanics, “Inside the Government’s Backup Plan for GPS Failure,” Popular Mechanics, December 1, 2009. <http://www.popularmechanics.com/technology/gadgets/news/4266972>)

Satellite-based navigation has become a ubiquitous tool for business, military and personal use. The downside is that any disruption in the Global Positioning System could wreak havoc down on Earth. This year, the Department of Homeland Security decided that a 30-year-old navigation system used by mariners will be upgraded to back up GPS. The decision preserves the Long-Range Aids to Navigation (LORAN) network, which has been teetering on the verge of forced retirement since the 1980s, according to the Coast Guard's Navigation Center. The backbone of LORAN is a network of transmission stations, many located in remote regions, staffed with Coast Guard personnel, and equipped with antennas as tall as 900 ft. The 2009 DHS budget allocates $34.5 million for the Coast Guard to start upgrading the LORAN system with modern electronics and solid-state transmitters. Users of the enhanced system, called eLORAN, will acquire and track signals from ground stations in much the same way they triangulate signals from multiple satellite feeds. LORAN also adds a data channel that can handle more detailed information. The system won't just wait for GPS to fail: eLORAN stations will continually transmit time-keeping data needed for navigation and warnings about coming disruptions. Why GPS Needs a Backup Plan Intentional Jamming Threat: GPS signals use low-powered, high-frequency signals that are easy to block. eLORAN Fix: Uses high-powered transmitters that send stronger signals requiring more power to disrupt. Environmental Interference Threat: Signals from GPS sats need to be in the line of sight of receivers and are blocked by metal, mountains and reinforced concrete. eLORAN Fix: Terrestrial signals bend around the Earth's curvature and can penetrate urban canyons and dense foliage. Cosmic Radiation Threat: Unusually large solar flares can produce radio bursts over the same frequency bands as GPS satellite transmissions. eLORAN Fix: Cosmic radio waves cannot penetrate the ionosphere, so LORAN signals are immune to interference. Antisatellite Weapons Threat: Future ground-based missiles could target and knock out GPS satellites. eLORAN Fix:Ground stations can be more easily guarded from attacks, including those by missiles.

## \*\*\*Other Disads\*\*\*

## AT: Weaponization

### The US would solve perception of SBSP as a weapon

NSS 7 (Joseph Rouge, SBSP Study Group Director, National Space Security Office, “Space Based Solar Power as an Opportunity or National Security”, http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, 10/9/2007) SV

The SBSP Study Group found that there is likely to be concern, both domestically and internationally, that a SBSP system could be used as a “weapon in space,” which will be amplified because of the interest shown by the DoD in SBSP. Mitigating these concerns, developing trust, and building in verification methods will be key to political consensus for sustainable development of SBSP. Recommendation: The SBSP Study Group recommends that the federal government should take reasonable and appropriate steps to ensure that SBSP systems cannot be utilized as space‐based weapons systems, and to dissuade and deter other nations from attacking these strategic power sources, including but not limited to: Tasking a civilian federal agency to be the lead agency responsible for federal investments in SBSP and in the demonstration of key technologies needed by industry. Providing transparency and open public dialogue throughout the development and build‐out pha se to reduce the risk of public misperceptions regarding SBSP. Encouraging all nations to develop SBSP systems — either on their own or as partners, customers, suppliers, or co‐owners with any U.S. development effort to maximize the stakeholder base and to minimize the potential antagonist base. Mandating open international inspections of SBSP systems before launch from Earth to the extent necessary to ensure that the systems being launched are not weapons. Developing internationally approved on‐orbit inspection systems that can verify compliance with international agreements

### SBSP can’t weaponize – laundry list

Hornitschek et al 8 (Mike, Colonel and military researcher - USAF, Coyote Smith – colonel and scientist - USAF, Paul Demphouss – Lt. Colonel USMC, “Strategic Importance,” Ad Astra Spring 2008. <http://www.nss.org/adastra/AdAstra-SBSP-2008.pdf>)

When first confronted with the idea of gigawatts of coherent energy being beamed from a spacebased solar power (SBSP) satellite, people immediately ask, “wouldn’t that make a powerful weapon?” Depending on their bias that could either be a good thing: developing a disruptive capability to enhance U.S. power, or a bad thing: proliferating weapons to space. But the NSSO is not interested in spacebased solar power as a weapon. 1. The DoD is not looking to SBSP for new armaments capabilities. Its motivation for studying SBSP is to identify sources of energy at a reasonable cost anywhere in the world, to shorten the logistics lines and huge amount of infrastructure needed to support military combat operations, and to prevent conflicts over energy as current sources become increasingly costly. 2. SBSP does not offer any capability as a weapon that does not already exist in much lessexpensive options. For example, the nation already has working ICBMs with nuclear warheads should it choose to use them to destroy large enemy targets. 3. SBSP is not suitable for attacking ground targets. The peak intensity of the microwave beam that reaches the ground is less than a quarter of noon-sunlight; a worker could safely walk in the center of the beam. The physics of microwave transmission and deliberate safe-design of the transmitting antenna act to prevent beam focusing above a pre-determined maximum intensity level. Additionally, by coupling the transmitting beam to a unique ground-based pilot signal, the beam can be designed to instantly diffuse should pilot signal lock ever be lost or disrupted. 4. SBSP would not be a precision weapon. Today’s militaries are looking for more precise and lower collateral-damage weapons. At several kilometers across, the beam from geostationary Earth orbit is just too wide to shoot individual targets—even if the intensity were sufficient to cause harm.

### SBSP is not a weapon and spurs international cooperation rather than arms races

NSS 7 (Joseph Rouge, SBSP Study Group Director, National Space Security Office, “Space Based Solar Power as an Opportunity or National Security”, http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, 10/9/2007) SV

FINDING: The SBSP Study Group found that when people are first introduced to this subject, the key expressed concerns are centered around safety, possible weaponization of the beam, and vulnerability of the satellite, all of which must be addressed with education. Because the microwave beams are constant and conversion efficiencies high, they can be beamed at densities substantially lower than that of sunlight and still deliver more energy per area of land usage than terrestrial solar energy. The peak density of the beam is likely to be significantly less than noon sunlight, and at the edge of the rectenna equivalent to the leakage allowed and accepted by hundreds of millions in their microwave ovens. This low energy density and choice of wavelength also means that biological effects are likely extremely small, comparable to the heating one might feel if sitting some distance from a campfire. The physics of electromagnetic energy beaming is uncompromising, and economies of scale make the beam very unsuitable as a “secret” weapon. Concerns can be resolved through an inspection regime and better space situational awareness capabilities. The distance from the geostationary belt is so vast that beams diverge beyond the coherence and power concentration useful for a weapon. The beam can also be designed in such a manner that it requires a pilot signal even to concentrate to its very weak level. Without the pilot signal the microwave beam would certainly diffuse and can be designed with additional failsafe cut‐off mechanisms. The likelihood of the beam wandering over a city is extremely low, and even if occurring would be extremely anti‐climactic. Certainly both the rectenna and satellite are vulnerable to attack, just like every other type of energy infrastructure. However, it takes significantly more resources and sophistication to attack an asset in geostationary orbit than it does to attack a nuclear power plant, oil refinery or supertanker on Earth. The satellite is also very large and constructed of a number of similar redundant parts, so the attack would need to be very precise. An attack on the receiving antenna would probably be the least value‐added attack, since it is a diffuse and distributed array of identical modular elements that can be quickly repaired while the receiving station continues to operate. Nevertheless, the best routes to security are a diversity and redundancy of clean energy sources, and a cooperative international regime where those who are capable of damaging a SBSP system also have an interest in preserving the new infrastructure for their own benefit.

### SBSP development results in US soft power and international cooperation rather than backlash

NSS 7 (Joseph Rouge, SBSP Study Group Director, National Space Security Office, “Space Based Solar Power as an Opportunity or National Security”, http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, 10/9/2007) SV

The interim review did not uncover any hard show‐stoppers in the international legal or regulatory regime. Many nations are actively studying Space‐Based Solar Power. Canada, the UK, France, the European Space Agency, Japan, Russia, India, and China, as well as several equatorial nations have all expressed past or present interest in SBSP. International conferences such as the United Nations‐connected UNISPACE III are continually held on the subject and there is even a UN‐affiliated non‐governmental organization, the Sunsat Energy Council, that is dedicated to promoting the study and development of SBSP. The International Union of Radio Science (URSI) has published at least one document supporting the concept, and a study of the subject by the International Telecommunications Union (ITU) is presently ongoing. There seems to be significant global interest in promoting the peaceful use of space, sustainable development, and carbon neutral energy sources, indicating that perhaps an open avenue exists for the United States to exercise “soft power” via the development of SBSP. That there are no show‐stoppers should in no way imply that an adequate or supportive regime is in place. Such a regime must address liability, indemnity, licensing, tech transfer, frequency allocations, orbital slot assignment, assembly and parking orbits, and transit corridors. These will likely involve significant increases in Space Situational Awareness, data‐sharing, Space Traffic Control, and might include some significant similarities to the International Civil Aviation Organization’s (ICAO) role for facilitating safe international air travel. Very likely the construction of a truly adequate regime will take as long as the satellite technology development itself, and so consideration must be given to beginning work on the construction of such a framework immediately.

### SSP leads to international cooperation rather than backlash

Lusk-Brook & Litwin 00 (Kathleen E. Lusk-Brooke, Geroge H. Litwin, American Society of Macro Engineering, “Organizing and Managing Satellite Space Power”, http://www.sciencedirect.com/science/article/pii/S0265964600000175, 5/17/2000) SV

2.2. Global interest demands multinational cooperation: There is growing interest in SSP in many countries. In Japan, SSP is given a high ranking of importance (i.e., more than 40% of 100 specialists gave SSP the highest importance ranking) [9]. Soviet/Russian scientists have also investigated the transfer of energy to Earth [10]. Erb has proposed a US Government–Industry Council on Space Solar Power to Earth to develop a National Space Power Plan, with analogous efforts in other spacefaring countries [11]. Sellers suggests that Comsat/Intelsat might be a model for the operating structure and financing of a solar power satellite [12]. With the globalization of the Internet, as well as consolidation and partnering in aerospace, telecommunications, and high technology, we now have truly global systems of information exchange, dialogue and decision making. Management studies of decision making and distributed intelligence in global business organizations demonstrate the enormous power of such organizations when they utilize collective decision-making arrangements to take advantage of resource availability and unmet demands [4, 5 and 13. D.G. Goehle, Decision marking in multinational corporations. , UMI Research Press, Ann Arbor, MI (1980).13].

## AT: Commercialization DA

### Plan solves the DA – government expenditure boosts private sector development

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

Finding: The SBSP Study Group found that a small amount of entry capital by the US Government is likely to catalyze substantially more investment by the private sector. This opinion was expressed many times over from energy and aerospace companies alike. Indeed, there is anecdotal evidence that even the activity of this interim study has already provoked significant activity by at least three major aerospace companies. Should the United States put some dollars in for a study or demonstration, it is likely to catalyze significant amounts of internal research and development. Study leaders likewise heard that the DoD could have a catalytic role by sponsoring prizes or signaling its willingness to become the anchor customer for the product. These findings are consistent with the findings of the recent President’s Council of Advisors on Science and Technology (PCAST) report which recommended the federal government “expand its role as an early adopter in order to demonstrate commercial feasibility of advanced energy technologies.”

## AT: US oil DA

### No Link-Oil companies will find other resources

Singer 7 (Jeremy Singer, Staff Writer at Space in MSNBC, “Pentagon may study space-based solar power”, http://www.msnbc.msn.com/id/18056610/ns/technology\_and\_science-space/t/pentagon-may-study-space-based-solar-power/, 4/11/07) SV

The concept of space-based solar power might appear to threaten traditional energy industries, Kueter said. However, the rapidly increasing demands for energy and diminishing supply of natural resources means that traditional energy companies may need to find new ways of doing business in the future, and they could likely find a way to be a part of the space-based solar power effort through ways like contributing expertise in areas like energy distribution, he said. The NSSO would likely ask experts from industries like electrical power to be involved in the study if it chooses to conduct it to draw on their experience with power distribution, Smith said. If the NSSO initiates the study on space-based solar power, it would likely be the first time that the Pentagon has looked at the concept, Hornitschek said. Smith said he hoped the study could create a repository of information about space-based solar power that may have been conducted by other agencies, as well as any that may have existed within the military. Hornitschek said it is too early to estimate the likely constellation size, types of orbits or cost of a space-based solar-power constellation. However, the satellites would likely feature very large, powerful solar arrays. In addition, the cost of launching a constellation of such large satellites with the types of launch vehicles available today would be a challenge, Hornitschek said. Mankins said a large constellation could demonstrate a significant launch opportunity to industry, and could provide the stimulus needed for industry to bring reusable launch concepts to fruition.

## \*\*\*Counterplans\*\*\*

## \*\*\*AT: EU CP and Soft Power NB\*\*\*

## No Solvency

### No solvency – internal divisions prevent success

Selding ‘10 (Peter B. de Selding, Staff Writer at Space News, “Mistrust Dilutes Goodwill at Global Space Exploration Conference”, http://www.spacenews.com/civil/101021-mistrust-global-exploration-conference.html, 10/22/2010) SV

PARIS — An Oct. 21 conference of the world’s spacefaring nations to discuss space exploration featured a heavy dose of good feelings but also highlighted the mistrust that will slow the effort: Germany’s suspicions of France, France’s fear of being dominated by the United States, Russia’s distrust of long-term U.S. government policy, the U.S. distaste for new international bureaucracies and many governments’ refusal to start multibillion-dollar investments. Organized by the European Union, of which Belgium holds the six-month rotating presidency, the second International Conference on Space Exploration in Brussels, Belgium, confirmed the results of the first conference, held in Prague, Czech Republic, a year ago: It is difficult to discuss a space exploration strategy in the absence of one. The meeting ended with an agreement to meet in Italy in 2011 to pursue discussions, and to consider the creation of a group of experts to guide the effort. But alongside the statements that space exploration is of necessity a global enterprise calling for global cooperation, individual governments used the conference to raise less-noble issues that lurk beneath the surface. Peter Hintze, state secretary in the German Ministry of Economics, which leads German space policy, said Germany wanted Europe’s Ariane 5 rocket to be center stage in Europe’s exploration strategy. But he also threw a dart at France: “If the Ariane 5 is needed for an institutional mission and is not available, then this is a major problem in terms of cooperation. If it is required for an institutional mission, it should be available for that mission,” Hintze said, referring to the fact that the Ariane 5 launch of Europe’s Automated Transfer Vehicle-2 (ATV-2) to the international space station scheduled for December has been moved to February to permit the vehicle to conduct three commercial launches.

### No solvency – EU can’t solve own issues

London ’11 ( Jill Treanor, Staff Writer for The Sydney Morning Herald. “EU doubts over debt strategy” http://www.smh.com.au/world/eu-doubts-over-debt-strategy-20110720-1houc.html. July 21, 2011)

GERMAN Chancellor Angela Merkel has quashed hopes of a lasting solution for Greece at today's crucial summit of European leaders, even as the International Monetary Fund warned of the repercussions for global economic growth if the euro zone's debt crisis was not tackled quickly. Amid suggestions that banks could be slapped with a levy of €10 billion ($A13.3 billion) over three years to raise €30 billion for another Greek bailout, the German Chancellor insisted that there would not be a ''spectacular event'', such as a restructuring of Greece's debt. ''Further steps will be necessary and not just one spectacular event which solves everything,'' she said. Economists warned that indecision after today's summit could cause severe tension in the markets. Advertisement: Story continues below Gabriel Stein, at Lombard Street Research, said: ''Ministers must come up with some solution that does not involve postponing once again the difficult positions that alone can solve the fiscal crisis. Otherwise the next eruption of the crisis won't be [later this year], it is more likely to be next week. Moreover, each failure to act raises the threshold for what must be done next time.'' In an assessment of euro zone policies, the IMF also piled pressure on European leaders to act to solve the crisis. ''It would be very costly not just for the euro zone but for the global economy to delay tackling the sovereign crisis,'' the IMF's Luc Everaert said. But for now some European Union leaders remain in disagreement with the European Central Bank, which has been arguing that a default by Greece would mean it could no longer provide funds to domestic banks. Leaders such as Dr Merkel believe the private sector needs to shoulder the burden of rescuing Greece. However, there was confusion in the markets yesterday when Ewald Nowotny, head of Austria's central bank, appeared to suggest that Greece could default on its debt without causing a crisis for its banking sector. He later issued a statement insisting that he shared the view of the ECB that a default was unpalatable. The confusion about the stance of the ECB towards Greece pushed yields on two-year Greek bonds through 40 per cent as speculation mounted that a default was more likely. European leaders are at odds with one another and with the ECB over demands by Germany and Finland that private investors bear some of the burden of a new Greek bailout. While Dr Merkel said the crisis couldn't be resolved in ''one spectacular step'', Greek counterpart George Papandreou said the summit could be a ''make-or-break moment'' for the euro region. Greece's sovereign-debt crisis risks contaminating the rest of the euro region even if officials avert a default, the IMF has warned. The European Central Bank continues to demand a response that will not be considered by ratings agencies to be the first default among countries that use the euro. It amounts to what observers describe as a game of political and financial chicken. The markets are becoming fed up with the uncertainty. Investors are now demanding sharply higher interest rates to buy the debt of Italy and Spain - the third and fourth-largest economies in the euro zone. Otherwise, analysts warn, continued confusion about the euro will spread to other weak members of the euro zone. Italy alone has debts of 120 per cent of its annual gross domestic product, and must refinance nearly a quarter of its debt - nearly €400 billion - in the next 18 months. That figure alone is larger than all of Greece's debt of some €340 billion.

### No solvency – debt crisis collapses EU

Furedi ’11 (Frank, Staff Writer for Spiked and author of On Tolerance: A Defence of Moral Independence. “Why the EU is so clueless about the Euro crisis” http://www.spiked-online.com/index.php/site/printable/10908/. 20 July 2011)

The slide of the Euro on the money markets signals the possibility that the European Union may not survive its sovereign-debt contagion in its present form. However, European policymakers refuse to acknowledge their own responsibility for this problem and are reluctant to take any decisive action to contain it. Policymakers often indulge in what is called responsibility-avoidance. EU functionaries have perfected the practice of responsibility-avoidance; in fact they have transformed it into an artform. In recent years, whenever I talked to insiders in the Brussels beltway, they often lectured me about Britain’s annoying and disappointing Euro-sceptics. In the months following the first stage of the Euro-crisis, their disappointment shifted its attentions to Germany. All of a sudden, German unilateralism became the spectre haunting the EU political class. At times, one even heard it suggested that the Germans were deliberately trying to transform Europe’s little economic difficulty into a major crisis in order to extend and consolidate their influence over the continent. That was then. In recent weeks, after the downgrading of Portugal’s sovereign debt to junk status, EU groupspeak has mutated into a frenzy of invective against the big three American credit-rating agencies: Moody’s, Standard & Poor’s and Fitch. All of a sudden these agencies stand accused of malevolently conspiring to destroy Europe. The president of the European Commission, Jose Manuel Durrao Barroso, swiftly assumed leadership of this depressing blame game, condemning Moody’s for being responsible for Portugal’s economic predicament. He denounced the company’s analysis of Portugal’s financial crisis as biased and speculative. Barroso’s refusal to confront Europe’s financial crisis head-on is shared by a significant section of the EU political establishment. However, they rarely put forward their alternative analysis, their blame game, with any conviction. Indeed, in recent weeks the impression I got when talking to people in Brussels is that they sense that Greece is only the beginning and that what is at stake is not only the Euro but the whole EU project. I have visited Brussels regularly during the past five years, but this is the first time that my interlocutors revealed their fears that the Euro crisis is more than a financial one. It might also represent the end of an era, they suggest. Since my visit to Brussels last week, the Euro has slid even further on the money markets and now Italy shows every sign of becoming the new Portugal, if not the new Greece. However, what’s really fascinating about recent developments is not the financial crisis but the political paralysis afflicting EU policymakers. Typically, politicians are pointing the finger of blame at each other. Italian president Silvio Berlusconi has openly clashed with his finance minister, Giulio Tremonti, though no doubt they agree that an American credit-rating agency is to blame for exposing the mess that the Italian economy is in. The rhetoric of responsibility aversion amongst EU policymakers is underpinned by the realisation that their institution lacks the authority and the political resources to deal with the current crisis. It is important to remember that the EU is a technocratic institution that has always responded to challenges by cobbling together deals behind closed doors. From its inception, the EU was an elitist managerial project that was able to construct and promote its agenda without having to respond directly to popular pressure. Decisions are never arrived at through public debate, and the majority of EU laws are formulated by the hundreds of secret working groups set up by the Council of the EU. Most of the sessions of the Council of Ministers are held in private, and the EU’s unelected European Commission has the sole right to put forward legislation. The most distinctive feature of the EU’s governance is that it is systematically pursued through insulated decision-making. For decades the EU political establishment has self-consciously constructed institutions that could insulate it from the necessity of having to respond to the type of public pressure faced by a democratic parliament. This invisible decision-making allowed a variety of political actors in Brussels, and in Europe’s national capitals, to avoid taking responsibility for unpopular decisions. In effect, policymakers were insulated from having to account for the consequences of their decisions. While insulated decision-making was an excellent way to avoid responsibility, it also eroded the EU’s capacity to respond decisively to unfolding events. The slowness with which EU ministers responded to the eruption of a volcano in Iceland last year exposed a serious failure of responsible decision-making. The unnecessary shutting down of European airspace was an act of a political establishment estranged from the ethos of leadership. Insulated from the populace, how could this institution ever learn what true leadership and real political initiative are all about? But this all pales into insignificance in comparison with the present financial crisis. The prerequisite for dealing with the decline of the Euro is crisis management exercised through political leadership. It requires that political leaders actually tell it like it is and go out and win support for the painful measures required to restore economic stability. Political leadership is not simply a desirable thing. It is essential. For without winning over a significant section of the European electorate, it will prove extremely difficult for European institutions to restore financial order in Europe. Regrettably, the EU establishment lacks the capacity to offer such leadership. Policymakers who are used to behind-the-scenes maneuvering are rarely able to reinvent themselves as persuasive leaders. It is ironic that even today there are many EU apologists who refuse to acknowledge the negative consequences of the EU’s democratic deficit. Amartya Sen, the Harvard University professor and a Nobel prize-winning economist, recently accused the credit-rating agencies of undermining legitimate governments and also blamed them for the marginalisation of the democratic tradition of Europe. He takes strong exception to the unopposed power of rating agencies and their power to issue unilateral commands. Typically, he is oblivious to the unilateral commands of Brussels. No doubt the rating agencies do have their own agenda, and they are certainly no more democratic than the European Commission. But good on them for forcing the EU to face the real world.

### No solvency – internal divisions from immigration issues block

Poggioli ‘11(Sylvia, Senior European correspondent for NPR’s foreign desk. “Immigration Issues Test Unity Of The European Union”. http://www.npr.org/2011/04/18/135496066/immigration-issues-test-unity-of-the-european-union. April 18, 2011)

In recent months, the European Union has been shaken by internal divisions over management of the single currency, the euro, and over NATO intervention in Libya. Now, even sharper differences have emerged over immigration. A showdown is under way at the France-Italy border on the Riviera, where thousands of recently arrived Tunisian migrants are testing the notion of a united Europe. In recent weeks, France has sent some 2,000 Tunisians back to Italy. Paris rejects Italy's decision to issue six-month permits to the 25,000 Tunisians who have landed on its shores since January. When a train from Italy pulls into Menton-Garavan station, members of France's anti-riot police force are waiting to board it. They single out a small group of dark-skinned young men, ask to see their identification, then take them in for questioning. On Sunday, fearing protests by anti-globalists, France temporarily blocked all trains from Italy. Challenges Crossing Borders The mood in Menton, like the rest of France, is not welcoming for new arrivals. The beachfront promenade extends for miles — ideal for jogging and leisurely walks. An elderly stroller has made the Riviera her retirement home. "There are so many Tunisians here, there so many other people here, it is becoming more and more aggressive," she says. "Myself — I don't go out at night, I am afraid. I don't think it is correct what the Italian government is doing. They should absorb them themselves." Like many other people here, the woman won't give her name for fear of reprisals, but she says she is Greek-born, with a British passport, living in France and calls herself European. But across the border in Ventimiglia, Tunisian migrants are beginning to question the notion of a borderless Europe. Lizar Taher, a Tunisian student, asks, "If Italy is a member of the EU, why does France say no, why does Germany say no?" EnlargeSylvia Poggioli/NPR The train station at Ventimiglia, in northern Italy. Tunisian migrants sleep on cardboard sheets at the station, waiting to be issued temporary travel permits. After a hazardous sea journey from Tunisia to the island of Lampedusa, hundreds of migrants have gathered at the border. They sleep in the train station on cardboard sheets, waiting for new temporary travel permits, issued, Rome says, for humanitarian reasons. But France insists all migrants must have a valid passport and hold sufficient sums of cash. Jamel Hakimi says that's an impossible demand. "If you have a place to sleep," he says, "you need 30 euros a day — that's 2,700 euros for three months. And for those with no place to sleep," Hakimi adds, "it's 5,600 for three months. They're blocking us all." Isolationism On The Rise In Europe? It's not just France that doesn't want them — Austria and Belgium are also threatening to close their borders and deploy anti-riot police. And a German official went so far as to accuse Italy of blackmailing its EU allies — a method, he said, typical of the mafia. Italian Foreign Minister Franco Frattini accused the EU of shirking its collective responsibilities. "Not France, not Italy, not Germany, [but] Europe," Frattini said, "and Europe is doing nothing about that, so Europe is divided. European integration failed on immigration." Prime Minister Silvio Berlusconi went further, wondering whether there is any sense in remaining within the European Union — an unprecedented remark in the EU's 50-year history which some analysts say helps foment fears and bolster the government's credentials on the extreme right. Callers to the Northern League radio station are venting their anger. "I'm proud to be a racist," one caller says. "We've gotten nothing from Europe; Italy should leave the EU." The same isolationist neo-nationalism is growing throughout much of Europe. Extreme right-wing parties are gaining ground — even in old Scandinavian socialist strongholds. But the clash over immigration could prove to be the most divisive among the 27 EU member states.

## Soft Power NB N/U

### Non-unique – EU already pursuing space solar and US needs to get into the race

Flournoy ’10 (Dan, Staff Writer for Space News and professor and editor of the Online Journal of Space Communication. “Why Not Space Solar Power?” http://spacenews.com/commentaries/100913why-not-space-solar-power.html. 13 September, 2010)

The 2010 U.S. National Space Policy, which supports a robust and competitive commercial space sector, is good news for those of us working to design and launch the new types of satellites that will collect solar energy in space and deliver it to Earth as a nonpolluting source of electrical power. Among the goals of President Barack Obama’s National Space Policy is expansion of international cooperation on mutually beneficial space activities to “broaden and extend the benefits of space” and “further the peaceful use of space.” As members of the National Space Society, the Society of Satellite Professionals International and the Space Energy Group, we believe space, as a shared resource, can best be explored and developed by a partnership of nations and businesses working together. Since acquiring clean and abundant energy is a common requirement for economic growth and an eventual necessity for the health of all societies, harvesting space solar power is a logical human endeavor when the high frontier is precisely where energy is most plentiful. But achieving success doing large-scale commercial innovation in outer space requires long-range planning, pooling of financial resources, sharing of knowledge and expertise, and the careful framing of a way forward that will earn and sustain the public trust. In naming the CEOs who will serve on his new advisory board on trade issues, Obama noted in July that the U.S. is on track to double exports in the next five years, and he pointed to some of the ways the American economy is being repositioned to better compete abroad. When adding that announcement to the outcomes of the June summit of the Group of 20 major industrial countries in Canada and recent federal policy statements intimating that (certain) export controls will be relaxed and cooperation in space will be encouraged, it would appear that the U.S. could be entering a new era of openness for international business. To this end, we would like to see some greater leadership and support given to space solar power development by NASA and the U.S. departments of Energy and Commerce. A helpful first step would be a U.S.-led space solar power feasibility study to which all interested nations are invited to contribute. In the context of the U.S. National Space Policy, such a feasibility study could lead the way in assessing and promoting “appropriate cost and risk sharing among participating nations in international partnerships.” It would demonstrate U.S. “tangible leadership in space,” leveraging the capabilities of allies while assuring continuing adherence to the U.N. Treaty on Exploration and Use of Outer Space — now signed by 125 states, including China and India — that dictates “nuclear weapons and other weapons of mass destruction” shall not be placed in outer space. At the International Space Development Conference held in Chicago in May, multiple nations participated in a National Space Society-initiated Solar Power Symposium to examine in depth opportunities and challenges for energy generation in near space. Former Indian President A.P.J. Abdul Kalam, scientist, aeronautical engineer and proponent of space solar power, addressing the symposium via videoconference, spoke to the need for international cooperation in space. He proposed a multilateral global initiative that could map out for us what needs to be done to bring space solar power to operational reality. From our perspective, space solar power is a meaningful science, engineering and commercial challenge that deserves our attention and investment. In the wake of the Gulf of Mexico oil disaster, we think it is time for the U.S. to put space solar power on our national energy agenda. At the same time, we must seek opportunities to learn from and participate with Canada, China, India, Japan, the European Union and others taking their first tentative steps to bring space solar energy to Earth. In a June Times of India commentary on strategic international diplomacy, U.S. Sen. John Kerry expressed support for a partnership with India that would include “the quest for new technologies and fresh ideas for economically viable ways to speed the shift to renewable energy sources. We believe that within the mainstream of global science, engineering and environmental management there are game-changing ideas and technologies that await testing. It is time to see some space solar power demonstration projects. Of all the possible alternative energy sources on the near horizon, we believe space solar power is our best chance for addressing the worldwide challenges of climate change, renewable energy and continued economic growth.

## Soft Power Alternative Causality

### We have 6 warrants for EU collapse : economic degradation, euro collapse, welfare system, birth rates, Ireland, and nationalist politics. SBSP can’t solve for all that so they can’t access soft power

### 1. Soft power gone – EU system inevitably collapses by 2013

Doyle ’11 (Larry, former National Sales Manager for JP Morgan. “When Will The European Union Collapse?” http://www.businessinsider.com/when-will-the-european-union-collapse-2011-5. May 10, 2011)

Who is willing to make book that the European Union as we know it will no longer exist within any of the time frames highlighted above? You think I’m reaching? I don’t. Why? Let’s navigate. The core principle of the Prisoner’s Dilemma promotes that individual economic entities will act in their own self interest at the expense of a collective interest. We witness this dilemma at work within many economic circles in the world today. Why do individual economic units behave in such a fashion? Often a lack of trust and a true sense of partnership will compel one economic unit– be it a state, a nation, or a trade bloc– from fully cooperating and embracing its supposed partner. While this dilemma is causing real conflict and friction in many parts of the world today, I believe the dilemma is most troubling within the peripheral countries of EU. Why so? When an electorate loses its voice and has formal economic policy dictated to it as in its best interest only to experience greater pain and anguish, you can rest assured the seeds of distrust and disintegration are being sown. I sense this reality is developing across a number of the smaller European nations at this very moment. You think I’m kidding? Let’s visit Finland and listen to Timo Soini the leader of the True Finns, a political party in Finland which espouses a populist and nationalist approach. The True Finns were previously an after thought but now represent a major political force in Finland. In today’s Wall Street Journal, Soini writes Why I Don’t Support Europe’s Bailouts, When I had the honor of leading the True Finn Party to electoral victory in April, we made a solemn promise to oppose the bailouts of euro-zone member states. Europe is suffering from the economic gangrene of insolvency—both public and private. Unless we amputate that which cannot be saved, we risk poisoning the whole body. To understand the real nature and purpose of the bailouts, we first have to understand who really benefits from them. At the risk of being accused of populism, we’ll begin with the obvious: It is not the little guy who benefits. He is being milked and lied to in order to keep the insolvent system running. He is paid less and taxed more to provide the money needed to keep this Ponzi scheme going. Meanwhile, a symbiosis has developed between politicians and banks: Our political leaders borrow ever more money to pay off the banks, which return the favor by lending ever more money back to our governments. In a true market economy, bad choices get penalized. Instead of accepting losses on unsound investments—which would have led to the probable collapse of some banks—it was decided to transfer the losses to taxpayers via loans, guarantees and opaque constructs such as the European Financial Stability Fund. The money did not go to help indebted economies. It flowed through the European Central Bank and recipient states to the coffers of big banks and investment funds. We already know that the Federal Reserve was the ultimate backstop to the EU bailout of Greece structured a year ago. How has that bailout worked? It hasn’t. Greece remains on the precipice of default and the citizenry is increasingly buried with bills they will never be able to repay. Ireland and Portugal are in similar straits. Spain is not much better. Italy? I’m not betting on them. Soini offers as much, Unfortunately for this financial and political cartel, their plan isn’t working. Already under this scheme, Greece, Ireland and Portugal are ruined. They will never be able to save and grow fast enough to pay back the debts with which Brussels has saddled them in the name of saving them. I would expect that the the populist movement which elevated Soini and the True Finns in the recent elections in Finland will prove to be a precursor to similar electoral results in other nations, including here in the United States. Will those results drive real change or will central bankers overrun and overrule the political powers to be? Time will tell but I recall that during my trip to Ireland a few months back, I learned that more and more people in Ireland are questioning why they would remain in the EU. Why would they slave under a debt burden which only serves to repay creditors–those being large international banks–who have done little to nothing to support the public interest. When people experience a real sense of disenfranchisement, they will react not only in the voting booth but ultimately in the street. Thus, I repeat my question. When will the EU collapse? Me thinks that at the current pace of economic degradation within a number of peripheral nations the EU will no longer exist as we know it by 2013. What do you think?

### 2. Soft power gone – euro headed towards currency collapse

Cox ’10 (Jeff, Staff Writer for CNBC. “European Union, Currency Are Headed for Collapse: Gartman” http://www.cnbc.com/id/36961257/European\_Union\_Currency\_Are\_Headed\_for\_Collapse\_Gartman. )

The current European debt crisis likely will not end until the euro collapses as a currency and takes the entire European Union with it, said Dennis Gartman, hedge fund manager and author of "The Gartman Letter." "I think the whole thing will go down to defeat, the whole thing will eventually unravel," Gartman said in an interview with CNBC.com. Gartman said he doesn't have a specific timetable for how long it will take for the collapse of the 17-year-old EU, but said, "it doesn't look good." The debt problems continued to escalate Wednesday as Greek citizens rioted in the streets over proposed austerity measures that would be required for any rescue plan to gain approval. At the same time, Moody's warned that it might downgrade the debt for Portugal, accelerating worries that Greece's unremitting debt worries could spread across the continent. Gartman holds the following long positions: 15 percent gold; 10 percent silver, and 15 percent each to Canadian and Australian dollars; he is short 15 percent each in euros, pounds and yen. The chaos was enough for Gartman to advise US investors to get out of the stock market. "It means confusion, it means a stronger dollar, it probably means weak commodity prices," Gartman said. "I think they should be out. People should be on the sidelines and out." A correction of as much as 15 percent in the US market "would be normal," he said. "There's always a chance we could get worse than that." In his daily letter to investors, Gartman said there is little chance of a peaceful, successful resolution of Greek's troubles. "The modern Greek culture is so dependent upon government largesse, and is so used to the fact that Greek fiscal irresponsibility will be bailed out by the taxes paid by responsible German workers and businessmen, that we cannot see this being resolved short of Greece being summarily tossed out of the EMU, or removing itself voluntarily," he wrote. He added that "we are not naive. Rather we are realists, and realists know that little other than chaos and the eventual breaking up of the EUR is the way of the future."

### 3. Soft power gone – Ireland causes EU collapse

Kollewe ’10 (Julia, Staff Writer for the Guardian. “Ireland crisis could cause EU collapse, warns president” http://www.guardian.co.uk/business/2010/nov/16/ireland-bailout-government-says-no-need-to-panic. 16 November 2010 )

The president of the European Union has warned that the EU could collapse unless the debt crisis that is gripping the region is resolved. Herman Van Rompuy, president of the European Council, raised the stakes ahead of this evening's showdown talks between finance ministers in Brussels. With Ireland and Portugal both on the brink of seeking a bailout, Van Rompuy warned that there is a serious risk of contagion spreading across the continent. "We're in a survival crisis," Van Rompuy said in a speech in Brussels. "We all have to work together in order to survive with the eurozone, because if we don't survive with the eurozone we will not survive with the European Union." However, the former Belgian prime minister added: "I'm very confident we will overcome this." Van Rompuy's speech added to the pressure on the Irish government, which was continuing to resist international pressure to accept a bailout this morning. Shares fell across Europe as pressure mounted on Ireland to accept an EU or International Monetary Fund bailout to stem contagion to other high-deficit eurozone countries. Portugal, which has seen its borrowing costs rocket along with Ireland's, warned last night that it too might need a rescue package. But despite fears that the crisis could bring down the euro, Ireland's minister for European Affairs Dick Roche denied this morning that Ireland needed emergency financing. "I would hope after the Ecofin meeting this afternoon and tomorrow there would be more logic introduced into this," he said on the BBC's Today programme. "There is no reason why we should trigger an EU or IMF-type bailout." He admitted: "There is a problem with liquidity in banks, there is no doubt about that, but I don't think that the appropriate response to that would be for European finance ministers to panic." Roche reiterated: "Ireland doesn't need to trigger any mechanisms because of sovereign debt and the problems in banks are being dealt with." Sovereignty at stake Ireland fears the punitive terms of a bailout as it would have to give up partial sovereignty over its finances and could be forced to raise corporation tax. Ireland's opposition finance spokesman, Michael Noonan, said yesterday that a bailout could lead to Ireland being suspended from the bond markets for three or four years. The FTSE 100 index in London had fallen by 94 points by midday, at 5726. In Asia, Japan's Nikkei closed down 0.3% at 9797.10 while Hong Kong's Hang Seng dropped 1.4% to 23,693.02. Portugal's finance minister Fernando Teixeira dos Santos said last night his country was at risk, as "we are not facing only a national or country problem – it is the problems of Greece, Portugal and Ireland." Many City analysts believe a bailout of some sort is inevitable. Gary Jenkins, head of fixed income research at Evolution Securities, said: "The latest idea seems to be that they [Ireland] utilise EU money to recapitalise their banking sector. This may be a more politically acceptable way of accepting aid for the Irish government. It is clear that as much as Ireland protests that they can fund themselves for a while yet that the EU would like the situation settled as quickly as possible to try and stop the contagion effect. The meeting of the EU finance ministers today could end up resembling a situation rather like when you meet an old friend who has fallen on hard times and try to help them out financially ... 'Go on, take it, it's nothing.' 'No, I couldn't, really, I'm fine.'" Nouriel Roubini, professor of economics at New York University and chairman of Roubini Global Economics, wrote in the Financial Times today: "Put simply the Irish – like the Greeks – are on a path to near or complete insolvency." He added: "The reason the EU has so far decided to provide emergency financing to Greece and Ireland is not because it lacks a legal mechanism for orderly restructuring; it is rather because of concerns about systemic contagion." But he argued that an orderly restructuring via bond exchange offers – in which sovereign debt is exchanged for other assets – is the best way to reduce this risk.

### 4. Soft power gone – birth rates and welfare system cause EU collapse

Christian ’05 (Nicholas, Staff Writer for NewsScotsman. “CIA gives grim warning on European prospects” http://news.scotsman.com/europeanunion/CIA-gives-grim-warning-on.2595505.jp. 16 January 2005)

THE CIA has predicted that the European Union will break-up within 15 years unless it radically reforms its ailing welfare systems. The report by the intelligence agency, which forecasts how the world will look in 2020, warns that Europe could be dragged into economic decline by its ageing population. It also predicts the end of Nato and post-1945 military alliances. In a devastating indictment of EU economic prospects, the report warns: "The current EU welfare state is unsustainable and the lack of any economic revitalisation could lead to the splintering or, at worst, disintegration of the EU, undermining its ambitions to play a heavyweight international role." It adds that the EU’s economic growth rate is dragged down by Germany and its restrictive labour laws. Reforms there - and in France and Italy to lesser extents - remain key to whether the EU as a whole can break out of its "slow-growth pattern". Reflecting growing fears in the US that the pain of any proper reform would be too much to bear, the report adds that the experts it consulted "are dubious that the present political leadership is prepared to make even this partial break, believing a looming budgetary crisis in the next five years would be the more likely trigger for reform". The EU is also set for a looming demographic crisis because of a drop in birth rates and increased longevity, with devastating economic consequences. The report says: "Either European countries adapt their workforces, reform their social welfare, education and tax systems, and accommodate growing immigrant populations [chiefly from Muslim countries] or they face a period of protracted economic stasis." As a result of the increased immigration needed, the report predicts that Europe’s Muslim population is set to increase from around 13% today to between 22% and 37% of the population by 2025, potentially triggering tensions. The report predicts that America’s relationships with Europe will be "dramatically altered" over the next 15 years, in a move away from post-Second World War institutions. Nato could disappear and be replaced by increased EU action. "The EU, rather than Nato, will increasingly become the primary institution for Europe, and the role Europeans shape for themselves on the world stage is most likely to be projected through it," the report adds. "Whether the EU will develop an army is an open question." Defence spending by individual European countries, including the UK, France, and Germany, is likely to fall further behind China and other countries over the next 15 years. Collectively these countries will outspend all others except the US and possibly China. The expected next technological revolution will involve the convergence of nano, bio, information and materials technology and will further bolster China and India’s prospects, the study predicts. Both countries are investing in basic research in these fields and are well placed to be leaders. But whereas the US will retain its overall lead, the report warns "Europe risks slipping behind Asia in some of these technologies". For Europe, an increasing preference for natural gas may reinforce regional relationships, such as those with Russia or North Africa, given the inter-dependence of pipeline delivery, the report argues. But this means the EU will have to deal with Russia, which the report also warns "faces a severe demographic crisis resulting from low birth rates, poor medical care and a potentially explosive Aids situation". Russia also borders an "unstable region" in the Caucasus and Central Asia, "the effects of which - Muslim extremism, terrorism and endemic conflict - are likely to continue spilling over into Russia". The report also largely en dorses forecasts that by 2020 China’s gross domestic product will exceed that of individual western economic powers except for the US. India’s GDP will have overtaken or be overtaking European economies. Because of the sheer size of China’s and India’s populations their standard of living need not approach European and western levels to become important economic powers. The economies of other developing countries, such as Brazil, could surpass all but the largest European countries by 2020.

### 5. Soft power gone – nationalist politics causes EU collapse

Kupchan ’11 (Charles A., professor of international affairs at Georgetown University and a senior fellow at the Council on Foreign Relations. “As Nationalism Rises, Will the European Union Fall?” http://www.cfr.org/europerussia/nationalism-rises-european-union-fall/p22856. August 29, 2010)

The European Union is dying--not a dramatic or sudden death, but one so slow and steady that we may look across the Atlantic one day soon and realize that the project of European integration that we've taken for granted over the past half-century is no more. Europe's decline is partly economic. The financial crisis has taken a painful toll on many E.U. members, and high national debts and the uncertain health of the continent's banks may mean more trouble ahead. But these woes pale in comparison with a more serious malady: From London to Berlin to Warsaw, Europe is experiencing a renationalization of political life, with countries clawing back the sovereignty they once willingly sacrificed in pursuit of a collective ideal. For many Europeans, that greater good no longer seems to matter. They wonder what the union is delivering for them, and they ask whether it is worth the trouble. If these trends continue, they could compromise one of the most significant and unlikely accomplishments of the 20th century: an integrated Europe, at peace with itself, seeking to project power as a cohesive whole. The result would be individual nations consigned to geopolitical irrelevance--and a United States bereft of a partner willing or able to shoulder global burdens. The erosion of support for a unified Europe is infecting even Germany, whose obsession with banishing the national rivalries that long subjected the continent to great-power wars once made it the engine of integration. Berlin's recent reluctance to rescue Greece during its financial tailspin--Chancellor Angela Merkel resisted the bailout for months -- breached the spirit of common welfare that is the hallmark of a collective Europe. Only after the Greek crisis threatened to engulf the euro zone did Merkel override popular opposition and approve the loan. Voters in local elections in North Rhine-Westphalia promptly punished her party, delivering the Christian Democrats their most severe defeat of the postwar era. Such stinginess reflects the bigger problem: Germany's pursuit of its national interest is crowding out its enthusiasm for the E.U. In one of the few signs of life in the European project, member states last fall embraced the Lisbon Treaty, endowing the union with a presidential post, a foreign policy czar and a diplomatic service. But then Berlin helped select as the E.U.'s president and foreign policy chief Herman van Rompuy and Catherine Ashton, respectively, low-profile individuals who would not threaten the authority of national leaders. Even Germany's courts are putting the brakes on the E.U., last year issuing a ruling that strengthened the national Parliament's sway over European legislation. This renationalization of politics has been occurring across the E.U. One of the starker signs of trouble came in 2005, when Dutch and French voters rejected a constitutional treaty that would have consolidated the E.U.'s legal and political character. The Lisbon Treaty, its watered-down successor, was rejected by the Irish in 2008. They changed their minds in 2009, but only after ensuring that the treaty would not jeopardize national control of taxation and military neutrality. And in Britain, May elections brought to power a coalition dominated by the Conservative Party, which is well known for its Europhobia. Elsewhere, right-wing populism is on the upswing--a product, primarily, of a backlash against immigration. This hard-edged nationalism aims not only at minorities, but also at the loss of autonomy that accompanies political union. For example, Hungary's Jobbik Party, which borders on xenophobic, won 47 seats in elections this year--up from none in 2006. Even in the historically tolerant Netherlands, the far-right Party for Freedom recently won more than 15 percent of the vote, giving it just seven fewer seats than the leading party. If these obstacles to a stable union weren't sobering enough, in July, the E.U.'s rotating presidency fell to Belgium--a country whose Dutch-speaking Flemish citizens and French-speaking Walloons are so divided that, long after elections in June, a workable governing coalition has yet to emerge. It speaks volumes that the country now guiding the European project suffers exactly the kind of nationalist antagonism that the E.U. was created to eliminate. The renationalization of European politics is a product, first and foremost, of generational change. For Europeans who came of age during World War II or the Cold War, the E.U. is an escape route from a bloody past. Not so for younger Europeans: A recent poll revealed that French citizens over 55 are almost twice as likely to see the E.U. as a guarantee of peace as those under 36. No wonder new European leaders view the E.U.'s value through cold cost-benefit calculations, not as an article of faith. Meanwhile, the demands of the global marketplace, coupled with the financial crisis, are straining Europe's welfare state. As retirement ages rise and benefits dwindle, the E.U. is often presented as a scapegoat for new hardships. In France, for example, anti-Europe campaigns have focused ire on the E.U.'s "Anglo-Saxon" assault on social welfare and on the "Polish plumber" who takes local jobs because of the open European labor market. The E.U.'s rapid enlargement to the east and south has further sapped it of life. Absent the cozy feel the smaller union had before the Berlin Wall came down, its original members have turned inward. The newer members from Central Europe, who have enjoyed full sovereignty only since communism's collapse, are not keen to give it away. As Poland's late president, Lech Kaczynski, put it soon after taking office in 2005, "What interests the Poles is the future of Poland and not that of the E.U." European participation in the wars in Iraq and Afghanistan has added to the weariness. In Germany, roughly two-thirds of the public opposes having German troops in Afghanistan -- not good news for an E.U. intended to project a united voice on the global stage. Although giving Europe more geopolitical heft is one of the union's raisons d'être, this task has no constituency; these distant wars, coupled with plunging defense expenditures mainly due to the economic downturn, are tempering the appetite for new burdens. "The E.U. is now just trying to keep the machine going," a member of the European Parliament told me recently. "The hope is to buy enough time for new leaders to emerge who will reclaim the project." Buying time may be the best the E.U. can do for now, but its slide is poised to continue, with costs even for those outside Europe. The Obama administration has already expressed frustration with an E.U. whose geopolitical profile is waning. As Defense Secretary Robert Gates complained in February to a gathering of NATO officials, "The demilitarization of Europe--where large swaths of the general public and political class are averse to military force and the risks that go with it--has gone from a blessing in the 20th century to an impediment to achieving real security and lasting peace in the 21st." As the United States tries to dig itself out of debt and give its armed forces a breather, it will increasingly judge its allies by what they bring to the table. In Europe's case, the offering is small and shrinking. Europe is hardly headed back to war; its nations have lost their taste for armed rivalries. Instead, less dramatically but no less definitively, European politics will become less European and more national, until the E.U. becomes a union in name only. This may seem no great loss to some, but in a world that sorely needs the E.U.'s aggregate will, wealth and muscle, a fragmented and introverted Europe would constitute a historical setback. Six decades ago, Jean Monnet, Robert Schuman and Konrad Adenauer were Europe's founding fathers. Today, the E.U. needs a new generation of leaders who can breathe life into a project that is perilously close to expiring. For now, they are nowhere to be found.

## \*\*\*AT: Prizes CP\*\*\*

## Prizes Bad

### Prizes are bad – Goal of Prize, Open Judging - Wrong Decisions, Financial Difficulties, also a reason why it links to the NB

COSA 04 (Committee on Space Aeronautics, Hearing: NASA CONTESTS AND PRIZES: HOW CAN THEY HELP ADVANCE SPACE EXPLORATION?, http://commdocs.house.gov/committees/science/hsy94832.000/hsy94832\_0.HTM, grubbs)

What are the pitfalls of using prizes to spur technology development. Prize contests can be less clear-cut than they first appear. Problems can develop in the design of the contest, the selection of a winner, and in the aftermath. First, NASA would have to be careful in its design of prize contests. The goal for which the prize was being awarded would have to be clearly enough described that contestants (and NASA) had a firm sense of what NASA was seeking and why. On the other hand, too detailed a description by NASA would limit the kinds of ideas that a contest could yield. A very detailed description would not end up being much different than contract specifications. The selection of a prize winner can also be difficult. Judges need to be open to unexpected ideas. **There are historical examples of revolutionary ideas losing prize contests because the judges were not open to unexpected ways of achieving the stated goals.** (See below.) On the other hand, NASA would also have to be careful to test prize entries carefully to ensure that there were no safety or other problems that might not be initially apparent. Finally, in terms of the aftermath, NASA would have to decide how to put a winning idea into actual use. A prize winner might not have the financial wherewithal or even the technical capacity to actually turn their winning idea into a viable product.

### Prizes involve conspiracies – judge intervention (not in a debate sense LoLs)

COSA 04 (Committee on Space Aeronautics, Hearing: NASA CONTESTS AND PRIZES: HOW CAN THEY HELP ADVANCE SPACE EXPLORATION?, http://commdocs.house.gov/committees/science/hsy94832.000/hsy94832\_0.HTM, grubbs)

One well known example is described in the best-selling book Longitude by Dava Sobel. By the 17th century sailors had mastered the ability to determine their exact latitude at sea, but calculating their exact longitude proved to be more complicated. In 1714, through an Act of Parliament, the British Government offered a reward of u20,000 (millions of dollars in today's money) for a ''practical and useful'' method of accurately determining longitude at sea. The size of the prize reflected both the importance of the issue and the fact that no reliable method was within reach at the time. John Harrison, a working class man with little formal education, eventually solved the problem by developing the first accurate clock that kept time accurately even during a ship's pitching and rolling at sea. However, despite the proven test of his invention at sea, the group administering the prize (the Board of Longitude) refused to award him the prize money—which **historians attribute to the Board's domination by astronomers who favored a rival, astronomy-based method of determining longitude.** The longitude case illustrates both the ability of a large prize to draw serious proposals and the problems that can arise if the judges have conflicts of interest.

### Double Bind the CP is either exclusionary and therefore stifles the innovation it claims to induce, or it leads to Suicide missions – poor people who want to win the money but don’t have the resources

COSA 04 (Committee on Space Aeronautics, Hearing: NASA CONTESTS AND PRIZES: HOW CAN THEY HELP ADVANCE SPACE EXPLORATION?, http://commdocs.house.gov/committees/science/hsy94832.000/hsy94832\_0.HTM, grubbs)

Other prize contests of this type have included privately sponsored prizes for feats of aviation in the early part of the 20th century. In 1919, Raymond Orteig, a New York hotel owner, offered $25,000 to the first aviator to cross the Atlantic from New York to Paris (or vice versa) without a stop. Charles Lindbergh, an unknown airmail pilot, won the Orteig prize on May 28, 1927, 33 b hours after taking off from Roosevelt Field on Long Island. **During this period, many skilled, famous aviators died attempting to win the prize. In fact, the study of aviation prizes (and early aviation in general) illustrates that fatalities were highly likely in the attempts at such prizes.** This raises the issue of whether fatalities can be expected in the area of prizes associated with manned space flight. If such prizes are conducted and a fatality does occur, it is important to determine if this could impede the development of such contests and stifle the potential innovation that could result from inducement prize programs.

### The prize maker ends up supporting the contestant – Costs $$ (Probably Links to the NB if Spending or Tix) -- Empirically proven

Lampson 04 (Nick, Congressman From Texas, Hearing: NASA CONTESTS AND PRIZES: HOW CAN THEY HELP ADVANCE SPACE EXPLORATION?, http://commdocs.house.gov/committees/science/hsy94832.000/hsy94832\_0.HTM, grubbs)

We are here today to examine the role that government-sponsored prizes might play in promoting the development of needed space technologies and, equally important, how such prize programs would need to be structured to be both effective and efficient. While there are numerous precedence for prizes offered by individuals and organizations in the private sector, there has been little experience today with governmentally-supported incentive prizes or contests. The often-sited Longitude Prize, first offered by the British Government in 1714, provides a historical example of the potential value of incentive prizes. On the other hand, it took decades and some politics for that prize finally to be awarded to the inventor of the first accurate marine chronometer. In addition, the winning inventor was, in fact, ''sustained for many years by research grants from the group administering the prize.'' That is a quote from a 1999 National Academy's report. And that is a fact that is not often acknowledged.

### Prizes Bad – Safety, Fairness: Lack of funding excludes Universities, researches and Non-profits

Johnson 04 (Eddie Bernice, Congressman From Texas, Hearing: NASA CONTESTS AND PRIZES: HOW CAN THEY HELP ADVANCE SPACE EXPLORATION?, http://commdocs.house.gov/committees/science/hsy94832.000/hsy94832\_0.HTM, grubbs)

With that in mind, I have two major concerns about this prize program proposed: safety and fairness. The safety of all participants must remain a primary concern since space travel is inherently dangerous. Under no circumstances should we allow the desire for profit to ever interfere with the responsibility of maintaining safety. NASA should also strive for higher standards of fairness. This proposed program would award a prize upon delivery of a desired technological development. Unfortunately, no funding will be provided to the participants in advance. While such an approach may bring in some entrepreneurs who might not otherwise participate in technology development for NASA, it may also eliminate participation of researchers from universities or not-for-profit organizations who typically are dependent on research grants to support themselves and their graduate students. I strongly urge that this prize proposal includes stipulations requiring the inclusion of small and/or minority-owned businesses and educational interests, otherwise, entire segments of our business community will be unfairly excluded from participating in financially lucrative NASA activities.

### Prizes are inherently risky – Risk to Reward does not usually pay off

Walker 04 (Robert, Chairman of Court of Scieneces, Hearing: NASA CONTESTS AND PRIZES: HOW CAN THEY HELP ADVANCE SPACE EXPLORATION?, http://commdocs.house.gov/committees/science/hsy94832.000/hsy94832\_0.HTM, grubbs)

Now in my mind, one of the things that you have got to be very careful of as you do this is how much risk you are willing to accept. I would suggest to you that the idea behind these prizes should be to increase the amount of risk that you are willing to accept. But you can not absolutely ensure safety if you are pursuing some of these prizes. The prizes are a risk-taking mechanism. And risk toward reward should be something that should be very inherent in what you do. And so I would hope that as you develop your mechanisms, maybe you need to go off-line and establish a charter or a foundation that offers some of these prizes so that Government doesn't have to get involved in the questions before appropriation committees every year about why did this fail, because in all honesty, you will probably get as much failure in these programs as you will get success, but that will be a good thing. Risk has to be a part of the end results that you want out of a prize program.

### People do Prize Competitions for the Thrill

Macauley 04 (Molly, Senior Fellow Resources for the future, Hearing: NASA CONTESTS AND PRIZES: HOW CAN THEY HELP ADVANCE SPACE EXPLORATION?, http://commdocs.house.gov/committees/science/hsy94832.000/hsy94832\_0.HTM, grubbs)

  If you look at the history of aviation prizes, Curtiss, Bleriot, Sigorsky, and Farman were among aviators winning prizes, but there were many, many dozens of others. The thing about those four individuals is they did end up developing a product line of aircraft. But dozens of others who were successfully competitive for prizes didn't. Apparently they were motivated just by the thrill, and that is my point that we can also see prizes given for solving mathematical theorems. And there was a prize offered by the French Academy of Sciences in 1790 for producing a soda alkali from salt. So again, the point is if some of the Centennial Challenges are addressing very unique, maybe NASA-specific innovations, they still may be fair game for prizes if one of the motivations is the thrill of invention and not necessarily the lure of a market.

**Problems – Wasteful, Duplicates, Property Rights, Fatalities**

**Macauley 04** (Molly, Senior Fellow Resources for the future, Hearing: NASA CONTESTS AND PRIZES: HOW CAN THEY HELP ADVANCE SPACE EXPLORATION?, http://commdocs.house.gov/committees/science/hsy94832.000/hsy94832\_0.HTM, grubbs)

A couple of disadvantages of prizes, as mentioned earlier, a cash flow problem for those entrepreneurs who want to step up to the plate but really are going to have to spend some time finding funding to underwrite the effort. And also there is a lot of economics research about possibly wasteful effort if you have got a lot of folks competing for a prize. From a broad, societal perspective, some economic theories have suggested that can be very wasteful. There is a duplication of effort in some of those cases. Now problems with government-sponsored prizes, I know that Doug to my left here will address these, but one of them is committing to a prize across Administrations, Congresses, and fiscal years. Another problem is how we want to allocate property rights. In my testimony, I have a note that the government, in 1960 or so, ended up paying Mrs. Robert Goddard and the Guggenheim Foundation a large settlement for government use of more than 200 of Robert Goddard's patents. Mr. Goddard died in 1945. So that is an example of where figuring out in advance how we want to handle property rights is very important… … And then finally I want to echo some comments that have already been made about the issue of safety and risk. Again, if we look at the history of prizes in aviation, my research assistant, Maria Shriver, seated behind me, has not only looked at the history of prizes but the history of fatalities during that era of the heyday of aviation prizes. And aviators were dying left and right each year, and yet the prizes continued to be offered, and many continued to be awarded. It was a very different attitude toward loss of life and risk sharply in contrast to our responses to Apollo I, Challenger, and Columbia. And I would assert that we really need to rethink attitudes toward and public policy for fatalities in the space program.

## Solvency Deficit- R&D

### Prizes are not a substitute for R&D / Only the Perm solves

Lampson 04 (Nick, Congressman From Texas, Hearing: NASA CONTESTS AND PRIZES: HOW CAN THEY HELP ADVANCE SPACE EXPLORATION?, http://commdocs.house.gov/committees/science/hsy94832.000/hsy94832\_0.HTM, grubbs)

 However, the establishment of incentive prizes should not be viewed as a substitute for adequate and sustained investment by the Federal Government in aeronautics and space R&D. **We need to support a robust NASA budget this year and in the years to come**. I hope that today's focus on prizes will not divert from the importance of continuing that critical federal involvement in space exploration and utilization.

## AT: Prizes CP- Perm Solves

### Perm Do both - Solely private space industry fails -- government involvement’s a key insurance policy

**PM 10** – Popular Mechanics, March 9, 2010, “What Happens If NASA's Constellation Program Dies?,” online: http://www.popularmechanics.com/science/space/nasa/4343791

President **Obama is selling** the idea of bringing **private space** into NASA's fold **as a** whole **new way of thinking, but NASA under** the **Bush** administration **already got the ball rolling** with ISS resupply contracts to the private space companies Orbital and SpaceX. But **the Bush team hedged their bets by keeping a government program functional.** What will happen if private space fails to create a reliable launch vehicle? So far they are doing well, but **a small engineering flaw or a mishap could** grind the effort to a halt. Also, **as private space companies morph into large contractors, will the risk of bureaucratic lethargy increase,** **as seen in the defense industry among prime contractors?**

### Only the perm can solve/The plan solves better

COSA 04 (Committee on Space Aeronautics, Hearing: NASA CONTESTS AND PRIZES: HOW CAN THEY HELP ADVANCE SPACE EXPLORATION?, http://commdocs.house.gov/committees/science/hsy94832.000/hsy94832\_0.HTM, grubbs)

If a technology is critical to a NASA objective—returning to the Moon by 2020, for example—should NASA depend on prizes for the development of relevant technologies? The timing of technology development may be easier to control through traditional means of doing business (although traditional programs have been plagued by delays at times). If NASA wanted to use both prizes and traditional grants and contracts to develop a technology, would those two paths be undertaken simultaneously? Would those with a contract have an unfair advantage? NASA and prize advocates have not yet made clear how they would answer such questions.

### Only the Perm Solves

Walker 04 (Robert, Chairman of Court of Scieneces, Hearing: NASA CONTESTS AND PRIZES: HOW CAN THEY HELP ADVANCE SPACE EXPLORATION?, http://commdocs.house.gov/committees/science/hsy94832.000/hsy94832\_0.HTM, grubbs)

Now I don't suggest that this should be NASA's sole way of pursuing space technology for the future. NASA has a lot of contributions to make on the high-tech arena or in the high-tech arena. And this should simply be a mechanism by which NASA reaches out beyond what it can traditionally do to get new thinking into the mix. I think that NASA can play a role in helping some of these people who are pursuing prizes by being a high-tech advisor to them along the line and give them ideas where they run into places where they might otherwise stumble. But it should be a part of a totality of a program, not just the only piece of the program.

### Only the Perm Solves

Macauley 04 (Molly, Senior Fellow Resources for the future, Hearing: NASA CONTESTS AND PRIZES: HOW CAN THEY HELP ADVANCE SPACE EXPLORATION?, http://commdocs.house.gov/committees/science/hsy94832.000/hsy94832\_0.HTM, grubbs)

I have a couple of buts to add with that, so let me go ahead and mention those. First of all, we are not working with a clean slate. We have a heavy hand of government in space R&D already through procurement contracts and through peer-reviewed research, which hasn't been mentioned a lot yet, so we have to think of prizes as a tool in an already existing portfolio. But with that in mind, you know, peer-reviewed research and contracts have a lot of imperfections, as do prizes. But some of them offset each other, so taken together, these are all a set of tools that I think we can effectively use to marshal innovation in our space program.

## \*\*\*AT Consult CPs\*\*\*

## Unilateral Action key

### US needs unilateral freedom in space policy – homeland security and military readiness

Kaufman 6 (Marc, staff writer for the Washington Post, “Bush sets defense as space priority,” Washington Post, 10/18/06. <http://www.washingtonpost.com/wp-dyn/content/article/2006/10/17/AR2006101701484.html>)

The document, the first full revision of overall space policy in 10 years, emphasizes security issues, encourages private enterprise in space, and characterizes the role of U.S. space diplomacy largely in terms of persuading other nations to support U.S. policy. "Freedom of action in space is as important to the United States as air power and sea power," the policy asserts in its introduction. National Security Council spokesman Frederick Jones said in written comments that an update was needed to "reflect the fact that space has become an even more important component of U.S. economic, national and homeland security." The military has become increasingly dependent on satellite communication and navigation, as have providers of cellphones, personal navigation devices and even ATMs.

### Full secession of veto power is ridiculous – kills all semblance of leadership

Carroll 9 (James FF, Notes & Comments Editor @ Emory International Law Review, J.D. with Honors @ Emory University School of Law, “Back to the Future: Redefining the Foreign Investment and National Security Act's Conception of National Security,” Emory International Law Review, 23 Emory Int'l L. Rev. 167, Lexis)

n221. See Thomas Friedman, Op-Ed., 9/11 is Over, N.Y. Times, Sept. 30, 2007, Â§ 4, at 12. This does not mean, however, that foreign countries should hold a veto over U.S. foreign or domestic policies, particularly policies that are not directly related to their national survival. Allowing foreign countries or international institutions to veto or modify unrelated U.S. policies would make a mockery of our foreign policy and destroy the credibility of American leadership. International cooperation does not require making our policy subservient to the whims of other nations. See generally The Allies and Arms Control (F.O. Hampson et al. eds., 1992). See also Khalilzad, supra note 177.

## Delay- Now is key

### International consultation delays plan passage – ISS proves

NSSO 7, SBSP Study Group, 2007, 10 October 2007, (National Security Space Office, Space-Based Solar Power, As an Opportunity for Strategic Security, Phase 0 Architecture Feasibility Study, http://www.acq.osd.mil/nsso/solar/SBSPInterimAssessment0.1.pdf)

FINDING: The SBSP Study Group found that although there was universal agreement that international cooperation was highly desirable and necessary, there was significant disagreement on what form the cooperation should take. There are multiple values to be balanced with respect to international cooperation. The various goods to be optimized include efficiency, speed of development, cost savings, existing alliances, new partnerships, general goodwill, American jobs and business opportunities, cooperation, safety & assurance, commercial autonomy, and freedom of action. Adding more and new partners may increase goodwill, but add additional layers of approval and slow development. Starting with established alliances and shared values fulfills some expectations and violates others. The spectrum of participation ranges from beginning with a demarche before the UN General Assembly, to privately approaching America’s closest allies, to arranging multi‐national corporate conferences. Many participants felt the International Space Station (ISS) overvalued cooperation for cooperation’s sake, and took mutual dependency too far.

### Immediate action key - fuel prices will tank military posture

Wald et al 9 (General Charles F Wald, Former Deputy Commander, Headquarters U.S. European Command, General Gordon R. Sullivan, Former Chief of Staff, U.S. Army, and Former Chairman of the CNA MAB, Vice Admiral Richard H. Truly, Former NASA Administrator, Shuttle Astronaut and the ﬁrst Commander of the Naval Space Command, “Powering America’s Defense,” May 2009. <http://www.cna.org/sites/default/files/Powering%20Americas%20Defense.pdf>)

While the current ﬁnancial crisis provides enormous pressure to delay addressing these critical energy challenges, the MAB warns against delay. The economic risks of this energy posture are also security risks. The U.S. consumes 25 percent of the world’s oil production, yet controls less than 3 percent of an increasingly tight supply. Oil is traded on a world market, and the lack of excess global production makes that market volatile and vulnerable to manipulation by those who control the largest shares. Reliance on fossil fuels, and the impact it has on other economic instruments, affects our national security, largely because nations with strong economies tend to have the upper hand in foreign policy and global leadership. As economic cycles ebb and ﬂow, the volatile cycle of fuel prices will become sharper and shorter, and without immediate action to address our nation’s long-term energy proﬁle, the national security risks associated with the nation’s and the military’s current energy posture will worsen.

## Perm solves

### Perm solves – simultaneous development with negotiation prevents delay

NSSO 7, SBSP Study Group, 2007, 10 October 2007, (National Security Space Office, Space-Based Solar Power, As an Opportunity for Strategic Security, Phase 0 Architecture Feasibility Study, http://www.acq.osd.mil/nsso/solar/SBSPInterimAssessment0.1.pdf)

FINDING:  The SBSP Study Group found that no outright policy or legal showstoppers exist to prevent the development of SBSP. Full‐scale SBSP, however, will require a permissive international regime, and construction of this new regime is in every way a challenge nearly equal to the construction of the satellite itself. The interim review did not uncover any hard show‐stoppers in the international legal or regulatory regime. Many nations are actively studying Space‐Based Solar Power. Canada, the UK, France, the European Space Agency, Japan, Russia, India, and China, as well as several equatorial nations have all expressed past or present interest in SBSP. International conferences such as the United Nations‐connected UNISPACE III are continually held on the subject and there is even a UN‐affiliated non‐governmental organization, the Sunsat Energy Council, that is dedicated to promoting the study and development of SBSP. The International Union of Radio Science (URSI) has published at least one document supporting the concept, and a study of the subject by the International Telecommunications Union (ITU) is presently ongoing. There seems to be significant global interest in promoting the peaceful use of space, sustainable development, and carbon neutral energy sources, indicating that perhaps an open avenue exists for the United States to exercise “soft power” via the development of SBSP. That there are no show‐stoppers should in no way imply that an adequate or supportive regime is in place. Such a regime must address liability, indemnity, licensing, tech transfer, frequency allocations, orbital slot assignment, assembly and parking orbits, and transit corridors. These will likely involve significant increases in Space Situational Awareness, data‐sharing, Space Traffic Control, and might include some significant similarities to the International Civil Aviation Organization’s (ICAO) role for facilitating safe international air travel. Very likely the construction of a truly adequate regime will take as long as the satellite technology development itself, and so consideration must be given to beginning work on the construction of such a framework immediately. o Recommendation: The complexity of negotiating any type of international legal and policy agreements necessary for the development of SBSP will require significant amounts of time (5 – 10 years). The SBSP Study Group recommends that the policy and legal framework development should begin simultaneously with any science and technology development efforts to ensure that intangible issues do not delay employment of technology solutions.

## Theory- Consult Illegit

### Consultation counterplans are illegitimate -

### Infinitely regressive – the aff can’t predict the infinite possibilities of actors to consult – kills fairness

### Education – consult CPs move the round away from topic specific education to discussion of irrelevant NBs and procedurals

### Not real world – a country *never* cedes full veto power to another – there’s no historical precedent or literature on the issue because it’s never happened – voter for policymaking and education

### Strat skew – they steal the entire 1AC ground and render it useless – gives us only 1 constructive and kills fairness

### Future fiat - This proves the CP is delay and magnifies why consult CP’s are bad - the Neg can non-unique DA’s to the CP because its passed later after consultation

## \*\*\*Other CPs\*\*\*

## AT: Private Sector CPs

### Private sector fails –

### A. No expertise or unity

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

A similar problem exists in the private sector. US space companies are used to small launch markets with the government as a primary customer and advocate, and do not have a developed business model or speak in a common language with the energy companies. The energy companies have adequate capital and understand their market, but do not understand the aerospace sector. One requires a demonstrated market, while the other requires a demonstrated technical capability. Without a trusted agent to mediate the collaboration and serve as an advocate for supportive policy, progress is likely to be slow.

### B. No motivation

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

When to Transition to Commercial Sector C - 3 At this stage is important to ask why SBSP is not yet being done by the commercial sector. What needs to happen for them to develop a credible interest? There are at least two private entities which are working on making SBSP a reality at the moment. One is actively looking both for investors and pre‐purchase agreements for the future sale of the power (primarily to India at this stage). Another is proposing a Congressionally chartered corporation (Sunsat Corporation) to create a public/private corporation such as when Comsat (for the development of communications satellites) was created in 1962. Elon Musk, one of the founders of PayPal, while still an undergraduate asked himself “Well, what are the most significant problems humanity faces?” “The three that [came to mind] were space exploration, the internet and clean energy. Just, you know, in terms of what would affect the world the most.” He became wealthy through the internet companies he created. When he was later looking at space businesses to start, he considered SBSP but eliminated it as an option as the necessary inexpensive launch capability did not exist. Instead he decided to work on the issue of cheap launch first, through the creation of SpaceX. (Also concerned about clean energy and the issues of CO2 emissions and global warming, he became a major investor in Tesla Motors, the new electric car company.) Investors and the commercial sector have concerns that still need to be addressed. They need to believe that SBSP is technically possible and that the necessary technologies to make it economically viable are at a sufficient stage of readiness that they can go out and purchase them, should they choose to become involved with SBSP. Intellectual property rights and frequencies for power beaming must be protected. Demonstrations and proofs of concepts are needed. Until business is confident this is practical and doable (and not just technically feasible assuming that various technologies mature) and that it can buy or make the components necessary, it will likely just watch but not act. Incentives would help. These could include loan guarantees, availability of balloon loans (where interest payments are deferred until the SBSP system is operational), transferable tax credits, subsidies similar to those already in existence for other alternative energy sources, energy pre‐purchase agreements, and/or tax holidays on the sale of the power. The commercial sector needs to see profit potential within a reasonable time frame. Electric utilities understand the need for large amounts of capital for infrastructure development. This can be acceptable as long as the payback is large and for an extended period. The payback period and rate of returns must be attractive after the amortization of the infrastructure costs.

### Perm solves better – government key to private sector will

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

FINDING: The SBSP Study Group found that adequate capital exists in the private sector to finance construction, however private capital is unlikely to develop this concept without government assistance because the timeframe of reward and degree of risk are outside the window of normal private sector investment. Capital in the energy and other sectors is available on the level needed for such a large project, but capital flows under fairly conservative criteria, and SBSP has not yet experienced a suitable demonstration, nor have the risks been adequately characterized to make informed business plan decisions.

### Aerospace can’t solve – lacks knowledge and resources

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

FINDING: The SBSP Study Group found that America’s aerospace industry alone does not have all of the necessary skills, knowledge, resources, systems or procedures necessary to effectively and economically develop SBSP in 2007. o Recommendation: The SBSP Study Group recommends that America’s energy companies should be included early on in the development of this new strategic energy resource.

## AT: Goals CP

### Government can pick winners

**Milford 4/26**/11 – President and founder of the Clean Energy Group (CEG) and Executive Director of the Clean Energy States Alliance (CESA) (Lewis, “Picking Winners or Losers,” Clean Energy Group, http://www.cleanegroup.org/blog/picking-winners-or-losers/)

Some arguments never die. Recently, some members of Congress criticized Energy Secretary Chu for “picking winners’ through his research and development programs like ARPA-E. This is an old canard that often comes from people who really think that the private sector alone, without government help, creates products and services. The evidence is so overwhelming to the contrary that the debate seems almost one sided by now. Everything from computer chips to cars is a result of long-term government research and development—as well illustrated in a recent Breakthrough Institute report. The argument against picking winners is especially wrong for emerging technologies that require deep and persistent public support. In the late 1990s, two Harvard professors in a book titled “Investing in Innovation: Creating Research and Innovation Policy that Works” demolished the myth that government should not be in the business of “picking winners.” And they came up with some surprising conclusions about the role of government in technology innovation. Branscomb and Keller describe how this bias against a government technology role can lead to two incorrect conclusions: …First, that markets do that most effectively; and second, that pork barrel politics is more likely to support the losers anyway. This neat two-step eliminates from the role of technology policy everything for which government is institutionally well-suited, from infrastructure building and investment incentives to support of skills training. It then notes that what is left is, of course, institutionally more appropriate for the market. The argument is legitimated simultaneously by our ancient faith in markets and our recent cynicism about politics. They admitted that the “picking winners and losers argument” might apply to some government efforts but not to the development of new technologies. Here’s why: Private markets often under-investment in new technologies; “empirical evidence suggests that as a result of spillovers of all kinds, the social returns to R&D spending on new technologies far exceed the private returns, perhaps by as much as 50 to 100 percent.” Private rates of return may not equal social rates of return—companies often cannot appropriate all the social benefits of an innovation and so fail to invest in what could be socially optimal technology. Because innovation is highly contingent—the actions of developers, governments and users are highly uncertain, making good information hard to come by, leading to great risks for investment—there is an inevitable misallocation of resources. “Some bets will pay off; some not at all. Winners and losers can only be positively identified in the revealing gaze of hindsight.” And finally, “…there is absolutely no evidence, beyond the economist’s leap of faith, that private investment is any more capable than public investment of separating the winners from the losers before the fact. The major difference is that private losers exit the market, while publicly backed losers are held to the higher standard of wasting taxpayers’ money.” Further, they confront another myth about government technology policy—that the federal government has in the past and in the future should only focus on R&D rather than commercial diffusion and use. Instead, they point out, in those areas where success has occurred, government has in fact played a much more expansive role than simply research and development. The most unlikely proof is in the defense area. Referring to the post-World War Two period in the U.S. regarding defense industry support as the most obvious time when many government policy tools were used, they note: Public spending supported the enormous development costs of relevant new technologies…In these cases, government underwrote the basic science research at universities and labs; direct R&D contracts accelerated the development of the technology; and defense procurement at premium prices constituted a highly effective initial launch market…A variety of mechanisms, ranging from patent pooling and hardware leasing (such as machine tool pools) to loan guarantees for building production facilities, helped to lower entry costs, diffused technology widely among competitors and set the stage for commercial market penetration. Aspects of this support model were adapted for government investment in other sectors, notably for public health, and produced similarly beneficial results… In the defense area, the U.S. government did not limit its role to only R&D, the typical critic’s myth, but “to the successful launch and diffusion of a technology development path—a trajectory—whose characteristics corresponded to the requirements of the commercial marketplace.” So to those who say, don’t pick winners, say it has always been so, and the country is better off for it. The alternative is to let losers win, and who wants that.

### Picking winners key to innovation—empirically proven.

**Atkinson ’10** – President of the Information Technology and Innovation Foundation (Robert D, “For Once and for All, Let's Agree the Government Can and Should Pick Winners,” April 22, Huffington Post, http://www.huffingtonpost.com/robert-d-atkinson-phd/for-once-and-for-all-lets\_b\_548145.html)

It's not just conservatives who worry about government being too active, many moderates and liberals who abide by the so-called Washington Consensus hold as an article of faith that while it's okay for the government to do things like fund basic research and improve education, by all means it should not "pick winners." On this matter (as on many), the Washington Consensus is wrong. Let's be clear about what "picking winners" means. It means government identifying industries and technologies where the country needs to be competitive globally, (i.e. health IT, nanotechnology, green energy, biotech, robotics, broadband) and then developing and implementing policies to work with the private sector to ensure that we grow and retain high-end jobs at home in these key sectors. Picking winners is not simply another name for an "industrial policy" in which the government selects specific firms or extremely narrow technologies, nationalizes industries, or impedes beneficial market forces. There's a clear reason why we need to put the rhetoric about socialism aside and start picking winners: we are starting to slip in terms of innovation and competitiveness. In a 2009 report examining innovation-based competitiveness among 40 nations, ITIF found that the United States has slipped from first to sixth place in the last decade, behind Singapore, Sweden, South Korea and others. In fact, the U.S. ranked dead last in progress in innovation and competitiveness over the last decade. Other countries are making more progress in developing the capacity to innovate and lead in key sectors. Unless we are willing to live with high unemployment, chronic trade deficits and relatively lower standards are living, we need to act. Creating the right market conditions for our companies and workers, (i.e. sound tax, trade, and fiscal policies) and investing in basic research are necessary but not sufficient conditions to keep pace with the nations around the world competing vigorously for innovation and related jobs. But we are kidding ourselves if we think that will be enough. Instead of the hodgepodge of policies from an array of complex tax laws to wasteful farm subsidies to a dizzying jumble of state incentives, we need a coordinated and comprehensive approach to making sure we not only come up with the next "big thing" but also that we do not have it snatched away from us. (Remember the VCR?) And that means picking key technologies and industries to focus on. But the free market opponents will say how can Washington outsmart the market? Is this the same market that through its infinite wisdom invested hundreds of billions of subprime mortgages? In fact, the government has a pretty good track record of picking winners. Just look at the technologies that the government had a key role in developing: the Internet, the web browser, the search engine, computer graphics, semiconductors, and a host of others. There are many other examples of success stories made possible not because government anointed a particular young entrepreneur but because the government made a conscious choice to open new pathways into which young innovators could embark. In the 1980s, we responded to Japan's economic ascendance by picking winners with the research and development tax credit, creating programs like the Advanced Technology Program and the Manufacturing Extension Partnership, and aggressively taking on unfair trade policies. We need to do the same today. It's time to break free of neo-classical economic orthodoxy that preaches that markets acting on their own optimize economic well-being and that low taxes, minimal regulation, and free trade alone can guarantee long-term U.S. leadership on the growth engines of the future. These ingredients work best when the government develops a strategy for correcting systemic "market failures" that limit innovation. We need to come to recognize that our country and not just our companies are competing and begin to think and act more like a country.

### need to re-underline. WAY too long as is

**Ezell ’10** – Senior Analyst with the Information Technology and Innovation Foundation (ITIF), with a focus on innovation policy, international information technology competitiveness, trade, and manufacturing and services issues (Stephen, “The Economist’s Strange Attack on Industrial Policy,” August 25, Progressive Fix, http://progressivefix.com/the-economist%E2%80%99s-strange-attack-on-industrial-policy)

It would be more constructive to envision a continuum of government-market engagement, increasing from left to right in four steps from a “laissez faire, leave it to the market” approach to “supporting factor conditions for innovation (such as education)” (which The Economist endorses, as, certainly, does ITIF) to going further by “supporting key technologies/industries” to at the most extreme “picking specific national champion companies”, that is, “picking winners.” And while it is generally inadvisable for governments to intervene in markets to support specific national champion companies, ITIF believes there is an appropriate role for government in placing strategic bets to support potentially breakthrough nascent technologies and industries. Ironically, The Economist asserts that, “Industrial policy may be designed to support or restructure old struggling sectors, such as steel or textiles, or to try to construct new industries, such as robotics or nanotechnology. Neither track has met with much success. Governments rarely evaluate the costs and benefits properly.” Yet, seconds later, the authors admit, “America can claim the most important industrial-policy successes, in the early development of the internet and Silicon Valley.” In one sentence, the article glosses over the point that the government, in this case the Defense Advanced Research Projects Agency (DARPA), “supported creation of ARPANET, the predecessor of the Internet, despite a lack of interest from the private sector.” (Italics mine.) But this point, as economists are wont to say, is “non-trivial.” In fact, it is the precisely the point. Early on, companies were reticent to invest in the nascent field of computer networking because the sums required were enormous and the technology was so far from potential commercialization that companies were unable to foresee how to monetize potential investments. Moreover, such basic research often results in knowledge spillovers, meaning the company cannot capture all the benefits of its R&D investment (in economist’s terms, the social rate of return from R&D is higher than the private rate of return), and thus companies tend to underinvest in R&D to societally optimal levels. Of course, this dynamic pertained not just to the Internet, but applies today to a range of emerging infrastructure technologies such as biotechnology, nanotechnology, robotics, etc. As Greg Tassey, Senior Economist at the National Institute of Standards and Technology (NIST), explains it, “the complex multidisciplinary basis for new technologies demands the availability of technology “platforms” before efficient applied R&D leading to commercial innovation can occur.” In other words, the levels of investment required to research and develop emerging technologies is so great that the private sector cannot support it alone, and thus, “government must increasingly assume the role of partner with industry in managing technology research projects.” Such was the case with the initial development of the Internet, as government stepped in and provided initial R&D funding, helped coordinate research between the military, universities, and industry, and thus seeded development of a breakthrough digital infrastructure platform, making the Internet a reality decades before the free market ever would have (if ever) if left to its own devices. And this admittedly-successful industrial policy has indeed been a spectacular success. As ITIF documented in a recent report, The Internet Economy 25 Years After.com, the commercial Internet now adds $1.5 trillion to the global economy each year—that’s the equivalent of adding South Korea’s entire economy annually. Moreover, the list of technologies in which government funding or performance of research and development (R&D) has played a fundamental role in bringing the technology to realization is long and compelling. It includes: the cotton gin, the manufacturing assembly line, the microwave, the calculator, the transistor and semiconductor, the relational database, the laser beam, the graphical user interface, and the global positioning system (GPS), amongst many others. The National Institute of Health (NIH) practically created the biotechnology industry in this country. And yes, even Google, the Web search darling, isn’t a pure-bred creature of the free market; the search algorithm it uses was developed as part of the National Science Foundation (NSF)-funded Digital Library Initiative. (But Google hasn’t done much to spur economic growth!) The point is that companies like IBM, Google, Oracle, Akamai, Hewlett-Packard, and many others may not have even come into existence─and certainly would not have prospered to the extent they have─if the U.S. government was not either an early funder of R&D for the technologies they were developing or a leading procurer of the products they were producing. And if you don’t get Intel developing the semiconductors, or Cisco building out the Internet, or Akamai securing it, or Google making it accessible, then you don’t get the downstream companies like the Amazons or eBays, the latter of which 724,000 Americans rely on as their primary or secondary source of income. Thus, while governments shouldn’t be creating and running such companies itself—that is for the free market to do—the government has a role to play in thoughtfully, strategically, and intentionally placing strategic bets on nascent and emerging technologies—as the United States did with information and communications technologies in the 1960s and 1970s—that have the potential to turn into the industries, companies, and jobs that drive an economy two to three decades hence. We call this innovation policy, as opposed to industrial policy. Today, this augurs the need for smart policies and investments in industries such as robotics, nanotechnology, clean energy, biotechnology, synthetic biology, high-performance computing, and digital platforms such as the smart grid, intelligent transportation systems, broadband, and Health IT. Explicit in this approach is a recognition that some technologies and industries are in fact more important than others in driving economic growth—that “$100 of potato chips does not equal $100 of computer chips.” Indeed, they are not because some industries, such as semiconductor microprocessors (computer chips) experience very rapid growth and reductions in cost, spark the development of subsequent industries, and increase the productivity of other sectors of the economy—not to mention support higher wage jobs. Yet The Economist frets that governments aren’t very good at identifying and investing in strategic emerging technologies. In impugning governments’ ability to pick winning technologies, the article cites failures such as France’s Minitel (a case of a country picking a national champion company) and argues that “Even supposed masters of industrial policy {like Japan’s MITI, or Ministry of International Trade and Industry} have made embarrassing mistakes.” But this would be tantamount to pointing to the spectacular failure of Apple’s Newton and arguing that Apple’s no good at innovation. The Economist seems to suggest that if governments failed 80-90% of the time in picking technology winners (and ITIF actually thinks their success rates are much higher), then they must be pretty incompetent at the effort and should stop trying altogether. But if private corporations followed that advice, then we would have no innovation whatsoever. Indeed, research by Larry Keeley of Doblin, Inc. finds that, in the corporate world, only 4 percent of innovation initiatives meet their internally defined success criteria. More than ninety percent of products fail in the first two years. Other research has found that only 8 percent of innovation projects exceed their expected return on investment, and only 12 percent their cost of capital. Yet companies have to continue to try to innovate, even in the face of these long odds, because research finds that firms that don’t replace at least 10 percent of their revenue stream annually are likely to be out of business within five years. The point is that just because innovation is difficult and success rates are low, this does not mean that corporations, or governments, should quit trying—or that their successes, like the Internet, can’t be spectacularly successful and have a profound impact on driving economic growth. But The Economist laments that industrial or innovation policies are subject to capture by industries. What this neglects is that all countries, including the United States, already have de facto industrial policies that favor some industries over others. In the United States, for example, our regulatory and tax system favors agribusiness through farm subsidies, the oil industry through oil subsidies, airlines and highways at the expense of rail, and mortgage and financial industries. In fact, it is precisely because the United States has historically lacked an ability, or willingness, to have a clearly defined innovation strategy and an open dialogue about “making strategic decisions about strategic industries” that we’ve ended up with a de facto industrial policy ill-suited to supporting industries that will drive economic growth in the future. The Economist notes that “there is no accepted framework for “vertical” policy, favoring specific sectors or companies.” True. So let’s make one. Finally, while The Economist criticizes President Obama’s new Strategy for American Innovation (released in 2009), it fails to come up with compelling evidence that breakthroughs such as mapping the human genome, unlocking nanotechnology’s potential, or achieving the technology-enabled transformations that need to occur in sectors from energy to transportation will occur solely because of the market’s ability to allocate capital efficiently. In this, it discounts the need for effective, intentional public-private partnerships to invest in and collaborate in the development and diffusion of these industries and technologies. This critique is not meant to pick on The Economist, which is usually chock full of solid reporting and informed commentary. Rather it is take on the myth of America’s purely free market capitalist system and make the case for an informed innovation policy. It is also to note that countries (like the United States) find themselves desperately turning to industrial policy in a last ditch effort to save stumbling sectors such as automobiles because they have failed to make adequate investments in innovation policies that would support science and technology, R&D, and the development and diffusion of innovative processes and technologies that could have helped keep old sectors like automobiles at the technology frontier while supporting the development of new sectors to drive the economy forward. Finally, it seeks to rebut the ideological and highly politicized assault on the idea the governments cannot make prudent, targeted bets on the industries of tomorrow. As Greg Tassey has noted, competition among governments has become a critical factor in determining global market share among nations. Indeed, the role of government is now a critical factor in determining which economies win and which lose in the increasingly intense process of creative destruction. There are appropriate and inappropriate roles for governments to play in this competition. Supporting education, removing barriers to competition, supporting free and fair global trade, opening countries to high-skill immigration, and targeting strategic R&D investments towards the technologies and industries of the future are appropriate roles for governments to play in this competition. Other government policies, such as mercantilist ones which deny foreign countries’ corporations access to domestic markets, pilfer intellectual property by stealing it outright or making it a condition of market access, creating indigenous or proprietary IT standards, failing to adhere to trade agreements, or directly subsidizing domestic companies or their exports, are illegitimate forms of global economic competition. The United States—and The Economist—must abandon its fanciful, stylized neoclassical notion of a purely free global economic marketplace unfettered by any form of government intervention whatsoever, and recognize that governments play a legitimate and crucial role in shaping the innovation capabilities of national economies. As between corporations, it’s a competition; and, as with companies, the ones that develop the best strategies and skills at fostering, developing, and delivering innovation are the ones most likely to win.

### Government picks winners as well as the free market

**Phillips 7/28**/10 – Senior Fellow of the IC2 Institute of the University of Texas at Austin (Fred, “Picking Winners: Is Government Technology Strategy Good Or Bad? (Or, Say “Thai Baht” Three Times Really Fast),” http://www.science20.com/machines\_organizations\_and\_us\_sociotechnical\_systems/picking\_winners\_government\_technology\_strategy\_good\_or\_bad\_or\_say\_%E2%80%9Cthai\_ba\_)

But can the private sector really do it better? There has been, I believe, no rigorous study of this question. The US federal government has difficulty dismantling a bureaucracy, once built. So I would concede, on the opinion level, that government may pick beneficial technological directions less efficiently than the private sector, because when the government is wrong, it’s expensive to recover. But I see no reason to believe corporations can pick winners more consistently. That is, out of ten chances to pick winners, I’d bet governments and corporations would be right about the same number of times.

## AT: Agent CPs

### Agent counterplans fail – no jurisdiction

NSSO, ‘7 – National Security Space Office [10/10/07, “Space-Based Solar Power as an Opportunity for Strategic Security: Report to the Director, National Security Space office Interim Assessment Release 0.1,” http://www.nss.org/settlement/ssp/library/final-sbsp-interim-assessment-release-01.pdf, DS]

FINDING: The SBSP Study Group found that SBSP development over the past 30 years has made little progress because it “falls between the cracks” of currently‐defined responsibilities of federal bureaucracies, and has lacked an organizational advocate within the US Government. The current bureaucratic lanes are drawn in such a way to exclude the likelihood of SBSP development. NASA’s charter and focus is clearly on robotic and human exploration to execute the Moon‐Mars Vision for Space Exploration, and is cognizant that it is not America’s Department of Energy (DOE). DOE rightly recognizes that the hard challenges to SBSP all lie in spacefaring activities such as space access, and space‐to‐Earth power‐beaming, none of which are its core competencies, and would make it dependent upon a space‐capable agency. The Office of Space Commercialization in the Department of Commerce is not sufficiently resourced for this mission, and no dedicated Space Development Agency exists as of yet. DoD has much of the necessary development expertise in‐house, and clearly has a responsibility to look to the long term security of the United States, but it is also not the country’s Department of Energy, and must focus itself on war prevention and warfighting concerns.