# 1AC Highways

## Plan

#### The United States federal government should substantially increase its Solar Roadways solar panel transportation infrastructure investment in the United States. The solar panels should not be built with Jellyfish protein or cadmium.

## Contention One: Warming

#### Warming is an existential risk.

Deibel ’07—Prof IR @ National War College (Terry, “Foreign Affairs Strategy: Logic for American Statecraft,” Conclusion: American Foreign Affairs Strategy Today)

Finally, there is one major existential threat to American security (as well as prosperity) of a nonviolent nature, which, though far in the future, demands urgent action. It is the threat of global warming to the stability of the climate upon which all earthly life depends. Scientists worldwide have been observing the gathering of this threat for three decades now, and what was once a mere possibility has passed through probability to near certainty. Indeed not one of more than 900 articles on climate change published in refereed scientific journals from 1993 to 2003 doubted that anthropogenic warming is occurring. “In legitimate scientific circles,” writes Elizabeth Kolbert, “it is virtually impossible to find evidence of disagreement over the fundamentals of global warming.” Evidence from a vast international scientific monitoring effort accumulates almost weekly, as this sample of newspaper reports shows: an international panel predicts “brutal droughts, floods and violent storms across the planet over the next century”; climate change could “literally alter ocean currents, wipe away huge portions of Alpine Snowcaps and aid the spread of cholera and malaria”; “glaciers in the Antarctic and in Greenland are melting much faster than expected, and…worldwide, plants are blooming several days earlier than a decade ago”; “rising sea temperatures have been accompanied by a significant global increase in the most destructive hurricanes”; “NASA scientists have concluded from direct temperature measurements that 2005 was the hottest year on record, with 1998 a close second”; “Earth’s warming climate is estimated to contribute to more than 150,000 deaths and 5 million illnesses each year” as disease spreads; “widespread bleaching from Texas to Trinidad…killed broad swaths of corals” due to a 2-degree rise in sea temperatures. “The world is slowly disintegrating,” concluded Inuit hunter Noah Metuq, who lives 30 miles from the Arctic Circle. “They call it climate change…but we just call it breaking up.” From the founding of the first cities some 6,000 years ago until the beginning of the industrial revolution, carbon dioxide levels in the atmosphere remained relatively constant at about 280 parts per million (ppm). At present they are accelerating toward 400 ppm, and by 2050 they will reach 500 ppm, about double pre-industrial levels. Unfortunately, atmospheric CO2 lasts about a century, so there is no way immediately to reduce levels, only to slow their increase, we are thus in for significant global warming; the only debate is how much and how serous the effects will be. As the newspaper stories quoted above show, we are already experiencing the effects of 1-2 degree warming in more violent storms, spread of disease, mass die offs of plants and animals, species extinction, and threatened inundation of low-lying countries like the Pacific nation of Kiribati and the Netherlands at a warming of 5 degrees or less the Greenland and West Antarctic ice sheets could disintegrate, leading to a sea level of rise of 20 feet that would cover North Carolina’s outer banks, swamp the southern third of Florida, and inundate Manhattan up to the middle of Greenwich Village. Another catastrophic effect would be the collapse of the Atlantic thermohaline circulation that keeps the winter weather in Europe far warmer than its latitude would otherwise allow. Economist William Cline once estimated the damage to the United States alone from moderate levels of warming at 1-6 percent of GDP annually; severe warming could cost 13-26 percent of GDP. But the most frightening scenario is runaway greenhouse warming, based on positive feedback from the buildup of water vapor in the atmosphere that is both caused by and causes hotter surface temperatures. Past ice age transitions, associated with only 5-10 degree changes in average global temperatures, took place in just decades, even though no one was then pouring ever-increasing amounts of carbon into the atmosphere. Faced with this specter, the best one can conclude is that “humankind’s continuing enhancement of the natural greenhouse effect is akin to playing Russian roulette with the earth’s climate and humanity’s life support system. At worst, says physics professor Marty Hoffert of New York University, “we’re just going to burn everything up; we’re going to heat the atmosphere to the temperature it was in the Cretaceous when there were crocodiles at the poles, and then everything will collapse.” During the Cold War, astronomer Carl Sagan popularized a theory of nuclear winter to describe how a thermonuclear war between the Untied States and the Soviet Union would not only destroy both countries but possibly end life on this planet. Global warming is the post-Cold War era’s equivalent of nuclear winter at least as serious and considerably better supported scientifically. Over the long run it puts dangers from terrorism and traditional military challenges to shame. It is a threat not only to the security and prosperity to the United States, but potentially to the continued existence of life on this planet

#### Our science is best

Alley 10 – Professor of Geoscience @ Penn State

Richard, Professor of Geoscience @ Penn State, authored over 200 refereed scientific papers, which are "highly cited" according to a prominent indexing service, erved with distinguished national and international teams on major scientific assessment bodies, 11-17-2010, “CLIMATE CHANGE SCIENCE; COMMITTEE: HOUSE SCIENCE AND TECHNOLOGY;

SUBCOMMITTEE: ENERGY AND ENVIRONMENT,” CQ Congressional Testimony, Lexis

Background on Climate Change and Global Warming. Scientific assessments such as those of the National Academy of Sciences of the United States (e.g., National Research Council, 1975; 1979; 2001; 2006; 2008; 2010a; 2010b), the U.S. Climate Change Science Program, and the Intergovernmental Panel on Climate Change have for decades consistently found with increasingly high scientific confidence that human activities are raising the concentration of CO2 and other greenhouse gases in the atmosphere, that this has a warming effect on the climate, that the climate is warming as expected, and that the changes so far are small compared to those projected if humans burn much of the fossil fuel on the planet. The basis for expecting and understanding warming from CO2 is the fundamental physics of how energy interacts with gases in the atmosphere. This knowledge has been available for over a century, was greatly refined by military research after World War II, and is directly confirmed by satellite measurements and other data (e.g., American Institute of Physics, 2008; Harries et al., 2001; Griggs and Harries, 2007). Although a great range of ideas can be found in scientific papers and in statements by individual scientists, the scientific assessments by bodies such as the National Academy of Sciences consider the full range of available information. The major results brought forward are based on multiple lines of evidence provided by different research groups with different funding sources, and have repeatedly been tested and confirmed. Removing the work of any scientist or small group of scientists would still leave a strong scientific basis for the main conclusions. Ice Changes. There exists increasingly strong evidence for widespread, ongoing reductions in the Earth's ice, including snow, river and lake ice, Arctic sea ice, permafrost and seasonally frozen ground, mountain glaciers, and the great ice sheets of Greenland and Antarctica. The trends from warming are modified by effects of changing precipitation and of natural variability, as I will discuss soon, so not all ice everywhere is always shrinking. Nonetheless, warming is important in the overall loss of ice, although changes in oceanic and atmospheric circulation in response to natural or human causes also have contributed and will continue to contribute to changes. The most recent assessment by the IPCC remains relevant (Lemke et al., 2007). Also see the assessment of the long climatic history of the Arctic by the U.S. Climate Change Science Program (CCSP, 2009), showing that in the past warming has led to shrinkage of Arctic ice including sea ice and the Greenland ice sheet, and that sufficiently large warming has removed them entirely.

#### CO2 reduction solves.

Hansen et al 8 (James, Makiko Sato, PushkerKharecha, NASA/Goddard instutue for Space Studies, Columbia University Earth Institute. David Beerling, Department of Animal and Plant Sciences, University of Sheffield, Robert Berner, Mark Pagani, Department of Geology and Geophysics, Yale University, Valerie Masson-Delmotte, Lab Des Sciences du Climat et l'Enviornnement/Institut Pierre Simon Laplace, Maureen Raymo, Department of Earth Sciences, Boston University, Dana L. Royer, Department of Earth and Enviornmental Sciences, James C. Zachos, Earth and Planetary Sciences Dept., University of California, Santa Cruz, "Target Atmospheric CO2: Where Should Humanity Aim?", http://www.benthamscience.com/open/toascj/articles/V002/217TOASCJ.pdf)

Abstract: Paleoclimate data show that climate sensitivity is ~3°C for doubled CO2, including only fast feedback processes.Equilibrium sensitivity, including slower surface albedo feedbacks, is ~6°C for doubled CO2 for the range of climatestates between glacial conditions and ice-free Antarctica. **Decreasing CO2 was the main cause of a cooling trend that began 50 million years ago**, the planet being nearly ice-free until CO2 fell to 450 ± 100 ppm; barring prompt policychanges, that critical level will be passed, in the opposite direction, within decades. **If humanity wishes to preserve a planet similar to that on which civilization developed and to which life on Earth is adapted, paleoclimate evidence and ongoing climate change suggest that CO2 will need to be reduced** from its current 385 ppm to at most 350 ppm, but likelyless than that. The largest uncertainty in the target arises from possible changes of non-CO2 forcings. An initial 350 ppmCO2 target may be achievable by phasing out coal use except where CO2 is captured and adopting agricultural and forestrypractices that sequester carbon. If the present overshoot of this target CO2 is not brief, **there is a possibility of seeding irreversible catastrophic effects.**

#### Our studies account for a ride range of chemicals as well as the impact on clouds

NASA 10 (National Aeronautics and Space Administration, "Road Transportation Emerges as Key driver of Warming", Feb 18 2010, <http://www.giss.nasa.gov/research/news/20100218a/>. Noparstak)

For each sector of the economy, **Unger's team analyzed the effects of a wide range of chemical species, including carbon dioxide, nitrous oxide, methane, organic carbon, black carbon, nitrate, sulfate, and ozone**. **The team also considered how emissions from each part of the economy can impact clouds, which have an indirect effect on climate**, explained Surabi Menon, a coauthor of the paper and scientist at the Lawrence Berkeley National Laboratory in Berkeley, Calif. Some aerosols, particularly sulfates and organic carbon, can make clouds brighter and cause them to last longer, producing a cooling effect. At the same time, one type of aerosol called black carbon, or soot, actually absorbs incoming solar radiation, heats the atmosphere, and drives the evaporation of low-level clouds. This process, called the semi-direct aerosol effect, has a warming impact. The new analysis shows that emissions from the power, biomass burning, and industrial sectors of the economy promote aerosol-cloud interactions that exert a powerful cooling effect, while on-road transportation and household biofuels exacerbate cloud-related warming. More research on the effects of aerosols is still needed, Unger cautions. "Although our estimates of the aerosol forcing are consistent with those listed by the International Panel on Climate Change, a significant amount of uncertainty remains."

#### Two internals

#### 1. Electric vehicles

#### Dependence on cars make warming inevitable.

Socolow et al 4 (Robert, Professor of Mechanical and Aerospace Engineering at Princeton University. His current research focuses on global carbon management and fossil-carbon sequestration, Roberta Hotinski, ecoscientist turned science communicator who has worked at U.S. News & World Report, the National Science Foundation, and most recently Princeton University. As the Information Officer for Princeton's Carbon Mitigation Initiative, Dr. Hotinski helped to develop the "stabilization wedge", Jefferey B. Greenblatt, Research Staff MemberPrinceton Environmental Institute, Stephen Pacala, Director, Princeton Environmental Institute Ecology and Evolutionary Biology, Solving The Climate Problem, December 2004, <http://cmi.princeton.edu/wedges/pdfs/climate_problem.pdf>. Noparstak)

For example, a conspicuous source of awedge is **increased efficiency for the world’s light-duty vehicles—cars, vans,**sports utility vehicles (**SUVs), and light trucks**. **A** recent **study by the global auto industry**, the Sustainable Mobility Project(SMP),11**reports that the world’s lightduty vehicles emitted 0.8 billion tons of carbon as CO2 in 2000,** one-eighth of all global emissions. SMP predicts that **these emissions will** double in 2050, to 1.6 billiontons of carbon per year. In this scenario,while miles driven by light-dutyvehicles increases 123 percent (1.52 percentper year), average fuel economy(miles per gallon) increases by only 22percent (0.4 percent per year). **Representative values yielding such carbon emissions in 2054, for example, are** 1.6 billionlight-duty vehicles (versus about 600 milliontoday), **10,000 miles per year of driving per vehicle** (about the same as today)**and 30 miles per gallon average fuel economy**(versus somewhat more than 20miles per gallon today).

#### Shifting to electric solves car-related oil dependence.

Brusaw 12 (Scott, an electrical engineer with over 20 years of industry experience, including Director of Research and Development at a manufacturing facility in Ohio, and a voting member of NEMA, “Solar Roadways: A Real Solution”, http://www.solarroadways.com/vehicles.shtml. Noparstak)

Driving is part of the American way of life. While we represent 5 percent of the world's population, Americans use more than 33 percent of all oil consumed for road transportation. And as other countries adopt our lifestyle of freedom and mobility, the demand for oil is increasing.³ In the early 70's, over half of the globe essentially didn't use any oil. Today, everyone is hooked on trying to create a society that looks like ours. Other people want to live like us: they want cars and a nice house, air conditioning and refrigeration. And why shouldn't they? Daily use of petroleum worldwide: 53 million barrels a day for transportation overall 29 million barrels a day for land transport for people 19 million barrels a day for land transport for freight 5 million barrels a day for air transport for people and freight² So **what will happen when the world runs out of oil?We're told that we've got about another 50 years before this happens, but** there are many reasons to believe otherwise. There's a lot of speculation and disagreement on the topic "peak oil", but one fact is not debatable: oil has a very finite supply. The United States was the biggest producer of oil for over 100 years and no one thought we'd ever peak. Suburbia is already in trouble. The whole concept behind suburban life is that you commute to work 30, 40, 50 miles. That's only viable if you have cheap gas. The massive farms that feed the world are worked by internal combustion vehicles. In the absence of fossil fuel, how many people can the world support? Many people believe 1.5 to 2 billion people. Our planet's current population is now approaching 7 billion people. So again, what will happen when the world runs out of oil? The reality is that **no single solution that has been proposed will lead to a decrease in U.S. gasoline consumption or achieve U.S. energy independence.Eliminating 12 million barrels a day of oil imports from our daily lives is not plausible.³** Until now**: by replacing our deterioration highway infrastructure and crumbling power grid with the Solar RoadwaysT, we'd create a system that will support the recharging of all-electric vehicles. Using all-electric vehicles will eliminate the need for internal combustion engines. The removal of internal combustion engines eliminates our need for oil.Electric cars have** actually been around for a long time. They've just **never been very practical, due to the fact that they have to be recharged and there has never been an infrastructure for that**. **The Solar RoadwaysTallow electric cars to recharge at any rest stop or business** that has a parking lot made up of Solar Road PanelsT. Drivers can recharge their vehicles while eating at a restaurant or shopping at a mall. And with what we're currently paying at the gas pump, I think the conversion may be more acceptable to the American car owner than we may have thought imaginable!

#### U.S. automobiles key

DeCicco and Fung 6 (John, Ph.D. Mechanical Engineering, Princeton University, Freda, senior policy analyst for ICCT, former automotive analyst at Environmental Defense Fund, "Global Warming on the Road: The Climate Impact Of America's Automobiles", 2006 <http://www.edf.org/sites/default/files/5301_Globalwarmingontheroad_0.pdf>. Noparstak)

The global warming pollution from all **U.S.** cars and light trucks amounted to 314 MMTc in 2004. This **“rolling carbon” accounts for about one-half of CO2 emissions from all passenger vehicles around the world and about 6% of global energy-related CO2 emissions**. The amount of CO2 emitted a year from the U.S. vehicle stock is equivalent to the amount of carbon in a coal train 50,000 miles long. At the national level, data on the history of vehicle sales and statistics on vehicle usage enable us to breakdown the total rolling carbon by automaker and type of vehicle. Such an analysis shows, for example, that the CO2 emissions from each of GM’s, Ford’s and DaimlerChrysler’s vehicles exceed those from any electric power company. However one looks at the issue, **the car’s contribution to global warming pollution is enormous.** Rolling carbon can be analyzed in terms of the factors—VMT, fuel economy and fuel carbon content-that determine emissions. For developing new policies, however, it is instructive to consider the actors whose decisions influence each factor. Auto companies are, of course, a key actor through their product strategies and product design decisions. But other parties, including individuals and businesses that purchase and use vehicles, energy companies that provide auto fuel, and various levels of government that influence land-use and transportation decisions, all play a part in influencing the total rolling carbon. The total CO2 emissions from all vehicles on the road are in fact the result of complex and interdependent decisions made by many actors. Policy discussions on curbing automotive carbon emissions have tended to center on the technical factors that characterize the sector’s emissions. However, changing these factors to reduce auto carbon emissions will require complementary decisions by multiple actors who influence emissions. **Our rolling stock tally underscores the magnitude of automotive CO2 emissions, highlighting the potential roles of the many actors in the system**. It also suggests a need for new tools to help each actor understand how their decisions impact emissions, paving the way for new policies that can foster carbon-sensitive decisions making. Such a carbon management paradigm would serve to make carbon emissions reduction an objective in day-to-day decision making, so that each actor in sector can seek opportunities for reducing those aspects of total emissions that each can best influence.

#### Solar Roadways create convenient energy refuel stations--key barrier

Brusaw 12 (Scott, an electrical engineer with over 20 years of industry experience, including Director of Research and Development at a manufacturing facility in Ohio, and a voting member of NEMA, “Solar Roadways: A Real Solution”, http://www.solarroadways.com/vehicles.shtml. Noparstak)

**Since the Solar Roadway creates and carries clean renewable electricity, EVs can be recharged at any conveniently located rest stop, or at any business that incorporates Solar Road Panels in their parking lots** (restaurants for instance). Owners can plug their cars in and recharge while they're eating or shopping. **Engineers are even investigating ways to use mutual induction to charge EVs while they are driving down the Solar Roadway**! By the way: using **electric cars would eliminate most of the other half of the cause of global warming and could virtually wean the world off oil entirely**.For instance, let's say an EV leaves California and embarks on a road trip to Florida. Let's say the all-electric vehicle gets 180 miles on a single charge. That's about three hours worth of driving on the interstate. By then, most drivers would be about ready for a bathroom break or a snack. They could find a restaurant that incorporates Solar Road Panels in its parking lot. They pull into a parking space, plug their car into the "hitching post", and go inside. By the time the driver/passengers are recharged and ready to go, so is their car. They could do the same thing at a rest stop or a shopping mall.Businesses replacing coal power with solar power. **Drivers replacing their internal combustion engine vehicles with all-eletric vehicles, charged by renewable energy. The beginning of the end of our dependency upon fossil fuels**?

#### They also solve military emissions.

Brusaw 12 (Scott, an electrical engineer with over 20 years of industry experience, including Director of Research and Development at a manufacturing facility in Ohio, and a voting member of NEMA, “Solar Roadways: A Real Solution”, http://www.solarroadways.com/military.shtml. Noparstak)

Imagine being able to put “eyes and ears” on the ground anywhere in the world without putting human lives in danger. Drop a Solar Road Panel into the hills of Afghanistan via parachute. **The parachute detaches upon impact and is retracted beneath the panel**. Camera modules open and aim in every direction. A satellite dish configures itself for communications to anywhere in the world. Marines at Camp Lejeune, North Carolina control the direction of the infrared cameras and watch the images on their computer screens and call in strikes when needed. Unlike a conventional generator, **the Solar Road Panel makes no noise and leaves no thermal footprint for the enemy combatants to detect. No refueling is ever needed, keeping our troops out of harm’s way. Anywhere in the world, entire bases can be built upon Solar Road Panels.Power is automatically provided with no need for generators, which would require constant refueling. When the operation is over, the Solar Road Panels are loaded back up and deployed elsewhere.**

#### Ending military dependence alone could solve warming.

Hynes 11 (H Patricia, ofessor of Environmental Health at Boston University School of Public Health where she is Director of the Urban Environmental Health Initiative and works on issues of urban environmental health, environmental justice and feminism, "The Military Assault on Global Climate", Sep 8 2011, <http://truth-out.org/index.php?option=com_k2&view=item&id=3181:the-military-assault-on-global-climate>. Noparstak)

Correspondingly, **militarism is the most oil-exhaustive activity on the planet, growing more so with faster, bigger, more fuel-guzzling planes, tanks and naval vessels employed in more intensive air and ground wars**. At the outset of the Iraq war in March 2003, the Army estimated it would need more than 40 million gallons of gasoline for three weeks of combat, exceeding the total quantity used by all Allied forces in the four years of World War 1. Among the Army's armamentarium were 2,000 staunch M-1 Abrams tanks fired up for the war and burning 250 gallons of fuel per hour.[(2)](http://truth-out.org/index.php#2.)**The US Air Force** (USAF) **is the single largest consumer of jet fuel in the world**. Fathom, if you can, the astronomical fuel usage of USAF fighter planes: the F-4 Phantom Fighter burns more than 1,600 gallons of jet fuel per hour and peaks at 14,400 gallons per hour at supersonic speeds. The B-52 Stratocruiser, with eight jet engines, guzzles 500 gallons per minute; ten minutes of flight uses as much fuel as the average driver does in one year of driving! A quarter of the world's jet fuel feeds the USAF fleet of flying killing machines; in 2006, they consumed as much fuel as US planes did during the Second World War (1941-1945) - an astounding 2.6 billion gallons.[(3)](http://truth-out.org/index.php#3.) Barry Sanders observes with a load of tragic irony that, **while many of us** assiduously **reduce our carbon footprint through simpler living**, eating locally, recycling and reusing, energy conservation, taking public transportation, installing solar panels, and so on, **the single largest institutional polluter and contributor to global warming - the US military - is immune to climate change concerns. The military reports no climate change [emissions](http://usinfo.org/enus/government/forpolicy/kyoto.html" \t "_blank) to any national or international body**, thanks to US arm-twisting during the 1997 negotiations of the first international accord to limit global warming emissions, the Kyoto Protocol on Climate Change. To protect the military from any curbs on their activities, the United States demanded and won exemption from emission limits on "bunker" fuels (dense, heavy fuel oil for naval vessels) and all greenhouse gas emissions from military operations worldwide, including wars. Adding insult to injury, George W. Bush pulled the United States out of the Kyoto Protocol as one of the first acts of his presidency, alleging it would straitjacket the US economy with too costly greenhouse emissions controls. Next, the White House began a neo-Luddite campaign against the science of climate change. In researching "The Green Zone: The Environmental Costs of Militarism," Sanders found that getting war casualty statistics out of the Department of Defense (DoD) is easier than getting fuel usage data.

#### Reliance also hampers readiness and overstretches forces.

Erwin, 2006(Sandra I., “Energy Conservation Plans Overlook Military Realities,” National Defense Magazine, September,

[http://www.nationaldefensemagazine.org/issues/2006/September/DefenseWatch.htm](http://www.nationaldefensemagazine.org/issues/2006/September/DefenseWatch.htm" \t "_blank), accessed 7/7, JDC)

Are skyrocketing oil prices just a temporary drain on the U.S. economy or a lasting national security threat? If one is to draw conclusions from a recent stream of Pentagon policy directives, studies and congressional rhetoric, the Defense Department will soon have to get serious about taming its gargantuan appetite for fuel, most of which is imported from the volatile Middle East. “The fact is that nearly **every military challenge we face is either derived from or impacted by** one thing: **our reliance on fossil fuels and foreign energy sources** ,” says Rep. Steve Israel, D-N.Y., who co-founded a “defense energy working group” with Rep. Roscoe Bartlett, R-Md., and former CIA Director James Woolsey. “**In a world where we borrow money from China to purchase oil from unstable Persian Gulf countries to fuel our Air Force planes that protect us against potential threats from these very countries, it’s high-time to make the choices and investments necessary to protect our country**,” Israel says. When oil prices began to surge, Defense Secretary Donald Rumsfeld issued one of his trademark “snowflake” memos asking aides to come up with energy-saving schemes and technologies, such as hybrid vehicles and innovative power sources. In truth, it is hard to see how Rumsfeld’s directive could change **the reality of a military that mostly operates guzzlers, and has no tangible plans to change that** . Just two years ago, the Environmental Protection Agency gave the Pentagon a “national security exemption” so it can continue to drive trucks with old, energy-inefficient engines that don’t meet the emissions standards required for commercial trucks. The Army once considered replacing the mother of all fuel-gorgers, the Abrams tank engine, with a more efficient diesel plant. But the Army leadership then reversed course because it was too expensive. Most recently, the Army cancelled a program to produce hybrid-diesel humvees, and has slowed down the development of other hybrid trucks in the medium and heavy fleets. The Air Force has been contemplating the replacement of its surveillance, cargo and tanker aircraft engines, but the project was deemed too costly, and not worth any potential fuel savings. Subsequent to Rumsfeld’s 2005 snowflake, a number of military and civilian Pentagon officials have been eager to publicize various science projects aim ed at energy conservation , such as research into synthetic fuels, biofuels, hydrogen fuel cells, wind farms and solar power, to name a few. But while these efforts have paid off on the public-relations front, they are not expected to translate into any real energy savings , at least for the foreseeable future. “**In the short term, there is very little that politicians or anyone can do about the military’s dependence on fuel for transportation**,” says Herman Franssen, an energy consultant and researcher at the Center for Strategic and International Studies. New technologies in synthetic fuels and fuel cells will take decades to produce realistic alternatives that can migrate to military vehicles, airplanes and non-nuclear powered ships. For at least the next 20 to 30 years, says Franssen, “oil will still be the most important fuel.” **Synthetic fuels are mostly a pipe dream**. The only country that makes any significant amount of synthetic fuel is South Africa, whose apartheid government was forced to find an alterative to petroleum in the 1970s during a trade embargo. “The technology exists, but it’s costly and creates environmental problems,” Franssen says. **Biofuels** are promising, but it **will be decades before they can** substantially help to **reduce oil consumption** . Currently, just 4 percent of the gasoline sold in the United States is mixed with corn-derived ethanol

#### That kills heg.

Haass, 2005(Richard N, “The Case for "Integration”, The national interest,

[http://www.nationalinterest.org/ME2/dirmod.asp?sid=&nm=&type=Publishing&mod=Publications%3A%3AArticle&mid=1ABA92EFCD 8348688A4EBEB3D69D33EF&tier=4&id=A561B96740654978B3472EFEEB14C84F)](http://www.nationalinterest.org/ME2/dirmod.asp?sid=&nm=&type=Publishing&mod=Publications%3A%3AArticle&mid=1ABA92EFCD8348688A4EBEB3D69D33EF&tier=4&id=A561B96740654978B3472EFEEB14C84F" \t "_blank)

The second question is whether there will be sufficient capacity to carry out a foreign policy premised on integration. Integration requires **U.S. leadership**, which in turn **requires U.S. strength. The United States will need considerable economic and military resources to meet the significant challenges of this era and to discourage a renewed great power challenge. The United States enjoys considerable primacy, but how long this primacy will continue is in doubt** **given** the emergence of enormous fiscal and current account deficits, a strained military that may well be too small, **an energy policy that leaves the United States overly dependent on costly imported oil** and an educational system that over time seems likely to diminish U.S. competitiveness. **Doctrines and foreign policy more generally do not operate in a vacuum; integration or any other American approach to the world will only succeed if carried out by a country that is both able and willing to devote the requisite resources to the many tasks at hand**

#### Heg is good.

Thayer 6 (Bradley Thayer, professor of security studies at Missouri State, November/December 2006 “In Defense of Primacy,”)

A grand strategy based on American primacy means ensuring the United States stays the world’s number one power-the diplomatic, economic and military leader. Those arguing against primacy claim that the United States should retrench, either because the United States lacks the power to maintain its primacy and should withdraw from its global commitments, or because the maintenance of primacy will lead the United States into the trap of “imperial overstretch.” In the previous issue of The National Interest, Christopher Layne warned of these dangers of primacy and called for retrenchment. **Those arguing for** a grand strategy of **retrenchment** are a diverse lot. They include isolationists, who **want no foreign military commitments**; selective engagers, who want U.S. military commitments to centers of economic might; and offshore balancers, who want a modified form of selective engagement that would have the United States abandon its land-power presence abroad in favor of relying on airpower and seapower to defend its interests . But retrenchment, in any of its guises, must be avoided. **If the United States adopted such a strategy, it would be a profound strategic mistake that would lead to far greater instability and war in the world, imperil American security and deny the United States and its allies the benefits of primacy** . There are two critical issues in any discussion of America'’ grand strategy: Can America remain the dominant state? Should it strive to do this? **America can remain dominant due to its prodigious military, economic and soft power capabilities**. The totality of that equation of power answers the first issue. **The United States has overwhelming military capabilities and wealth in comparison to other states** or likely potential alliances. Barring some disaster or tremendous folly, that will remain the case for the foreseeable future. With few exceptions, even those who advocate retrenchment acknowledge this. So the debate revolves around the desirability of maintaining American primacy. Proponents of retrenchment focus a great deal on the costs of U.S. action but they fall to realize what is good about American primacy. The price and risks of primacy are reported in newspapers every day; the benefits that stem from it are not. A GRAND strategy of ensuring **American primacy** takes as its **starting point the protection of the U.S. homeland and American global interests**. These interests include ensuring that critical resources like oil flow around the world, that the global trade and monetary regimes flourish and that Washington'’ worldwide network of allies isreassured and protected. Allies are a great asset to the United States, in part because they shoulder some of its burdens. Thus, it is no surprise to see NATO in Afghanistan or the Australians in East Timor. In contrast, a strategy based on retrenchment will not be able to achieve these fundamental objectives of the United States. Indeed, **retrenchment will make the United States less secure** than the present grand strategy of primacy. This is because **threats will exist no matter what role America chooses to play in international politics.** Washington can not call a "“imeout"” and it cannot hide from threats .**Whether they are terrorists, rogue states or rising powers, history shows that** threats must be confronted. **Simply by declaring that the United States is** "g“inghome",”thus**abandoning its commitments** or making unconvincing half pledges to defend its interests and allies, does not mean that others will respect American wishes to retreat. To make such a declaration **implies weakness and emboldens aggression**. In the anarchic world of the animal kingdom, predators prefer to eat the weak rather than confront the strong .The same is true of the anarchic world of international politics. If there is no diplomatic solution to the threats that confront the United States, then the conventional and strategic military power of the United States is what protects the country from such threats. And when enemies must be confronted, **a strategy based on primacy focuses on engaging enemies overseas, away from American soil**. Indeed, a key tenet of the Bush Doctrine is to attack terrorists far from America'’ shores and not to wait while they use bases in other countries to plan and train for attacks against the United States itself. **This requires a physical, on - the - ground presence that cannot be achieved by offshore balancing** . Indeed, as Barry Posen has noted, U.S. primacy is secured because America, at present, commands the “global common”—the oceans, the world'’ airspace and outer space-allowing the United States to project its power far from its borders, while denying those common avenues to its enemies. As a consequence, the costs of power projection for the United States and its allies are reduced, and the robustness of the United States'’ conventional and strategic deterrent capabilities is increased.’

## Contention Two: The Grid

#### Power grid vulnerable now—terrorists see it as a target for a cyber attack

Serrano 11 (Richard A., staff writer for the Washington bureau, "U.S. power grid a terrorist target", Feb 11 2011, <http://www.spokesman.com/stories/2011/feb/11/us-power-grid-a-terrorist-target/>. Noparstak)

WASHINGTON – A major cyber attack somewhere in the United States is becoming increasingly possible, top government intelligence officials said Thursday, warning that **an assault on America’s power-grid system “represents the battleground for the future.**” The officials, speaking at a special hearing on Capitol Hill, also said that **while al-Qaida has been diminished** after nine years of the U.S. war on terror, **more foreign groups have risen up, increasing concerns** among U.S. authorities that one of them may eventually get their hands on a nuclear device. “**I don’t think there’s any question but that this is a real national security threat that we have to pay attention to,” CIA Director Leon Panetta said of a cyber attack in this country**. “The Internet, the cyber-arena … this is a vastly growing area of information that can be used and abused in a number of ways.” With that in mind, he told the House Permanent Select Committee on Intelligence, “When it comes to national security, I think this represents the battleground for the future. I’ve often said that I think **the potential for the next Pearl Harbor could very well be a cyber attack**.” Panetta said **terrorists are determined to find a way to hack into the power grid system in the United States, which** he said, “**brings down the financial system, brings down our government systems. You could paralyze this country**. And I think **it’s a real potential**, and that’s the thing we have to really pay attention to.” He noted that **extremists in Iran, Russia and China are developing “a significant capacity” to stage such an attack, and that already “hundreds of thousands” of attempts are being made to sneak into national security networks**. “We’ve got to develop not only a defense against that,” he said, “but we’ve got to put our assets in places where we can provide sufficient warning that these attacks are coming.” On the threat from nuclear, chemical and biological weapons, Michael E. Leiter, director of the National Counterterrorism Center, said extremists are trying to gain control of nuclear weapons in Pakistan, and in fact “remain committed to obtaining all types of weapons of mass destruction.” James Clapper, director of the Office of National Intelligence, was asked to elaborate. All he would say was, “Our assessment is that the nuclear weapons in Pakistan are secure. And that’s probably all we should say about that in public.”

#### Countries and terrorist organizations have already infiltrated our grid system and can shut it off during a time of war

Gorman 9 (Siobhan, writer for the Wall Street Journal, "Electricity Grid in U.S. Penetrated By Spies", April 8 2009, <http://online.wsj.com/article/SB123914805204099085.html>. Noparstak)

WASHINGTON -- **Cyberspies have penetrated the U.S. electrical grid and left behind software programs that could be used to disrupt the system**, according to current and former national-security officials.**The spies came from China, Russia and other countries**, these officials said, **and were believed to be on a mission to navigate the U.S. electrical system and its controls**. The intruders haven't sought to damage the power grid or other key infrastructure, but officials **warned they could try during a crisis or war**."**The Chinese have attempted to map our infrastructure**, such as the electrical grid," said a senior intelligence official. "**So have the Russians**."The espionage appeared pervasive across the U.S. and doesn't target a particular company or region, said a former Department of Homeland Security official. "**There are intrusions, and they are growing**," the former official said, referring to electrical systems. "**There were a lot last year**."Many of the intrusions were detected not by the companies in charge of the infrastructure but by U.S. intelligence agencies, officials said. **Intelligence officials worry about cyber attackers taking control of electrical facilities, a nuclear power plant or financial networks via the Internet**.Authorities investigating the intrusions have found software tools left behind that could be used to destroy infrastructure components, the senior intelligence official said. He added, "**If we go to war with them, they will try to turn them on.**"Officials said water, sewage and other infrastructure systems also were at risk."**Over the past several years, we have seen cyberattacks against critical infrastructures abroad, and many of our own infrastructures are as vulnerable as their foreign counterparts**," Director of National Intelligence Dennis Blair recently told lawmakers. "**A number of nations, including Russia and China, can disrupt elements of the U.S. information infrastructure."**

#### Even simple hacking could cause a chain reaction of nuclear meltdowns

GEI 10 (Galving Electricity Initiative, founded by CEO Robert Galvin, pushing for electric grid reform for a secure, sustainable, energy future, "The Electric Power System Is Insecure", http://galvinpower.org/resources/library/fact-sheets-faqs/electric-power-system-insecure

**There is evidence that terrorist organizations are considering an attack on the power grid**. In the summer of 2001, the coordinator for the city of Mountain View, Calif.’s Web site noticed a suspicious pattern of intrusions. **The FBI investigated and found** similar **“multiple casings of sites” in other cities throughout the United States. The probes seemed to originate in the Middle East and South Asia, and the visitors were looking up information about the cities’ utilities, government offices and emergency systems.** This information took on new significance when **U.S. intelligence officials examined computers seized from al-Qaida operatives** afterthe Sept. 11 attacks **and discovered what appeared to be a broad pattern of surveillance of U.S. infrastructure**.Yet **the electric power system appears to be extremely vulnerable to even relatively unsophisticated cyberattacks**.In 1997, as part of a previously classified Department of Defense exercise — code name “Eligible Receiver” — a team of **hackers from the** National Security Agency (**NSA**) was organized to infiltrate the Pentagon systems. **Using only publicly available computer equipment and hacking software**, the team **was able to** infiltrate and **take control of the computers serving the U.S. Pacific Command center, as well as power grids and 911 systems in nine major U.S. cities**.More than 50 percent of the electric utility personnel who responded to a survey by the Electric Power Research Institute believe that an intruder in the information and control systems at an electric utility could cause serious impact on, or beyond, the region for more than 24 hours. Open sources — including Federal Energy Regulatory Commission (FERC) filings, electric industry publications, regional maps and the Internet — could provide enough information to identify the most heavily loaded transmission lines and most critical substations in the power grid. Relatively simple hacking techniques could then be used to locate dial-in ports to these points and modify settings to trigger an outage. Only a detailed review of logs or the elimination of all other factors would lead to the detection of such an attack.**In the event of a simultaneous accident in which a nuclear power station is shut down at the same time the main power lines fail, the emergency siren system for the entire emergency planning zone will lose power and be unable to alert the surrounding population**. In response to a petition filed by Nuclear Information and Resource Service (NIRS) and 16 other organizations and local governments, the U.S. Nuclear Regulatory Commission (NRC) revealed that **28 reactor emergency planning zone siren systems are entirely reliant upon electricity from their regional grids. Another 18 sites have only partial emergency power backup available to siren systems.** Only 17 reactor sites have siren systems that are fully backed up with emergency power systems that would allow them to remain operational independent of the failure of main power lines.

#### Statistical risk analysis proves that the United States must act to protect against the increasing risk to our power grid

Simonoff et al 4 (Jeffrey, professor of statistics at New York University, Carlos Restrepo, Rae Zimmerman, New York University professors, "Risk Management and Risk Analysis-Based Decision Tools for Attacks on Electric Power, October 1 2004, <http://research.create.usc.edu/cgi/viewcontent.cgi?article=1158&context=nonpublished_reports&sei-redir=1&referer=http%3A%2F%2Fwww.google.com%2Furl%3Fsa%3Dt%26rct%3Dj%26q%3Dterrorist%2520attempt%2520power%2520grid%2520attack%2520potential%26source%3Dweb%26cd%3D4%26ved%3D0CFkQFjAD%26url%3Dhttp%253A%252F%252Fresearch.create.usc.edu%252Fcgi%252Fviewcontent.cgi%253Farticle%253D1158%2526context%253Dnonpublished_reports%26ei%3DJ7j5T-auLcGZqAHT7_mLCQ%26usg%3DAFQjCNG2O8M2NnxCfW2bmwDn0PV2NIoLAA#search=%22terrorist%20attempt%20power%20grid%20attack%20potential%22>. Noparstak)

A critical need exists to develop the means to provide decision tools to estimate the consequences of terrorist attacks against electric power systems as part of the growing field of risk analysis for terrorism events. This is particularly difficult in the U.S. given the very few terrorist attacks that have disabled electric power systems, and none that have actually directly targeted electric power. This paper has provided a framework for analyzing available electric outage data to gain a better understanding of the factors that influence outcomes such as the number of customers lost and duration of an outage. **The statistical models used reinforce the importance of probabilistic assessment of risk, whether that is estimating the probability of zero customer loss, or constructing prediction intervals within which outage characteristics such as duration and customer loss are predicted to fall with specified probability**. Clearly, **such risk assessment also leads directly to issues of risk management, such as in questions of resource allocation**. The analyses were done for the U.S. and Canada and the results show how the model can be used to identify important differences for the two countries. These patterns, besides being of interest in and of themselves, highlight the need for general statistical models for probabilistic risk assessment, since it is apparent that the consequences of outages differ for incidents in different places, at different times, and with different underlying characteristics. DRAFT 29 First, at **the level of overall trends in events over time, the number of disturbances to the electric grid increased over the period studied** for both countries. **In the U.S. the annual rate of increase was estimated to be 7.2%** and in Canada it was 8.2%. However, while the number of events with non-zero megawatt loss increased in the U.S. at an annual rate of 10%, in Canada there was no evidence of a time trend for these events. Similarly, the number of events with non-zero customer loss increased in the U.S. at an estimated annual rate of 14% but in Canada the model provided little evidence of any relationship with season or time for these events. Second, the results of the event level analyses can provide insights into the dynamics underlying the factors affecting disturbances in each country. The results show that the dynamic is different in the two countries. For example, in estimating the number of customers lost during an outage the model predicts that in the U.S. there is a weak but direct relationship with total number of customers served by a utility. In Canada the model suggests an inverse relationship. In the U.S. model there is no relationship between customer loss and season whereas in the Canada model customer loss is lower in the spring and summer. In modeling the duration of an event, the results suggest that in the U.S. outage duration was decreasing in the early 1990s and then started to increase in the mid-1990s. This is due to the fact that the relative frequency of the cause of the events changed over time, with weather related events becoming more common over time during this period and equipment related disturbances less so. Weather related events are associated with longer durations. The Canada data, on the other hand, show little evidence of any relationships. Third, the results of these models can provide information about outcomes such as expected customer loss and duration of outages in different seasons and for cities with different characteristics, and hence inform response to outages in both terror-related and non-terror-related circumstances. The results of the 50% prediction intervals shown in this paper for **cities with characteristics like those of New York City** and Toronto are very different. For example, **in terms of outage duration** the results for New York City suggest that the longest durations **are to be expected from weather events, unknown causes and third parties**. In Toronto the highest expected durations are from crime-related events. In terms of customer loss, **the results for New York City suggest crime and natural disasters could have the biggest impact**. In Toronto system protection, equipment failure, human error and crime have the highest impact.

#### Power grid failure collapses military forces—key to heg

Snider 12 (Annie, E&E reporter, "Pentagon still can't define 'energy security', much less achieve it", Jan 16 2012, http://www.eenews.net/public/Greenwire/2012/01/16/1

Hurricane **Katrina humbled U.S. military bases** in 2005, cutting power at air towers, training facilities and command centers just as it did everywhere else along the Gulf Coast.**The Naval Construction Battalion** Center in Gulfport, Miss., for example, a staging ground for regional relief operations after the storm, **needed relief** itself **after running for two weeks on backup power systems**. And **Keesler Air Force Base** near Biloxi, Miss., **lost its airfield lights and had to scramble to keep its hospital running after a generator was swamped**.While diesel generators kept critical missions going during Katrina, the storm **provided a wakeup call for Pentagon leaders concerned about terror attacks on the electric grid, which provides 99 percent of the energy that bases consume**. Could bases withstand a power outage that outlasts their three-to-seven-days' supply of diesel for backup systems? Is it wise for the military to rely on the same power plants and transmission lines that feed homes and businesses?**A terrorist attack that caused a long-term grid disruption "could significantly affect our military forces globally -- potentially blinding them, neutering their command and control, degrading their mobility and isolating them from their principal sources of logistics support,**" Paul Stockton, the Pentagon's assistant secretary for homeland defense, [wrote](http://www.hsaj.org/?fullarticle=7.2.11) recently in the online journal Homeland Security Affairs.A board of outside experts tasked by the Department of Defense to study the issue found in a 2008 [report](http://www.acq.osd.mil/dsb/reports/ADA477619.pdf) that there are significant gaps in DOD's ability to prevent and respond to major electrical outages."**Critical national security and homeland defense missions are at an unacceptably high risk of extended outages from failure of the grid**," the Defense Science Board concluded. "The grid is fragile, vulnerable, near its capacity limit, and outside of DOD control. In most cases, **neither the grid nor on-base backup power provides sufficient reliability to ensure continuity of critical national priority functions and oversight of strategic missions in the face of long-term** (several months) **outage**."And while the Pentagon has joined interagency efforts to beef up grid security, experts say solutions remain elusive. Four years after the Defense Science Board report, DOD has yet to define what "energy security" means at its bases, let alone how to assure it, according to dozens of interviews with military officials, lawmakers, defense energy experts, project developers and utilities.How DOD ultimately answers these questions will not only determine the limits of U.S. defenses; it is also likely to send waves through civilian energy and technology industries.

#### Solar Flares shutdown the power grid—the flare-up in March was a minor storm. Larger impacts are likely in the near future

Khan 12 (Amina, staff writer for the Los Angeles Times, interview with Mike Hapgood, a space weather scientist at the Rutherford Appleton Laboratory near Oxford, England, "How a solar flare could send us back to the Stone Age", May 9 2012, <http://www.csmonitor.com/Science/2012/0509/How-a-solar-flare-could-send-us-back-to-the-Stone-Age>. Noparstak)

Q: Is that the biggest geomagnetic storm on record?A: We always describe **the storm in 1859 as the biggest space weather event**. We know there were **huge impacts on the telegraph**, which **suggests there would be** similarly severe impacts on modern power grids. It's hard to compare it to the 1989 event because of the changes in our technology.Q: Many systems have been built to withstand a storm as big as the 1989 event. Is that good enough?A: A serious concern would be **whole regions losing electrical power for some significant time**. Here in the U.K., the official assessment is that we could lose one or two regions where the power might be out for several months.Q: What would the consequences be?A: In the modern world, we use electricity for so many things. **We require electrical power to pump water into people's houses and to pump the sewage away.** (You can imagine) what could happen if the sewage systems aren't pumping stuff away.**If you don't have power, you can't pump fuel into vehicles. If you don't have any fuel, traffic could come to a standstill**.Q: Could the economy function?A: Most of the time you're using credit cards, debit cards or you'll be getting money out of an ATM. If **you've lost the power**, **the computers** in the bank **that keep track of our money will have back-up power, but not the ATMs or the machines** in the shops. So **if you had a big power outage, it wouldn't be long before we'd be trying to find cash**.Q: What are the chances that something like this will happen soon?A: **A recent paper** (published in February in the journal Space Weather) tried to **estimate the chance of having a repeat of 1859** and came up **with a value of a 12 percent chance** of it happening **in the next 10 years**. **That's** quite a high risk.Q: What can be done?A: The biggest step is to make more and more people aware of the issue, so they're thinking about it in the way they design things. That's the most critical part.I think it's also getting a better picture of these very violent past events. We'd like to find out more about the scope of those events. We have a lot of old data from past events that's on paper – in newspapers and so on – and we're busy trying to find ways to turn it into digital.Q: We had **a recent flare-up of publicity in March thanks to a solar storm** that didn't really amount to much. Is this sort of coverage a good thing or a bad thing?A: It **makes** such **a good scare story**, and it's entertaining. It was a mildly interesting event, certainly, **but not at all big-league stuff**. **It makes people think, "Oh it's nothing really**," **so experts** like myself **are in danger of being in the crying-wolf situation**. That's something that is a concern to me, personally.

#### 1-in-8 chance that a solar storm large enough to cause a power grid failure will occur by 2020

Huffington Post 12 (Solar Flare Big Enough To Cause Catastrophe On Earth Called Surprisingly Likely, March 1 2012, <http://www.huffingtonpost.com/2012/03/01/solar-flare-big-enough-to-disrupt_n_1313136.html>. Noparstak)

An aurora borealis may be beautiful, but can there be too much of a good thing? **[A new study published in the journal Space Weather](http://www.agu.org/pubs/crossref/2012/2011SW000734.shtml" \t "_hplink) analyzed the frequency of the solar storms** that cause auroras and **found that there's a one in eight chance** that **by 2020the Earth will be affected by a major solar flare**.**The risk is far greater than previously thought**."Even if it’s off by a factor of two, that’s a much larger number than I thought,” study author Pete Riley, senior scientist at Predictive Science, a space "weather" research firm in San Diego, told [Wired](http://www.wired.com/wiredscience/2012/02/massive-solar-flare/" \t "_hplink).Why should a storm on the sun be cause for concern? As it turns out, **the high-energy particles liberated by a major flare might cause "disruption of the transportation, communication, banking and finance systems, and government services; the breakdown of the distribution of potable water owing to pump failure, and the loss of perishable foods and medications because of lack of refrigeration**,” according to a [National Resource Council report](http://www.nap.edu/catalog.php?record_id=12507" \t "_hplink) from 2008.Riley calculated the relationship between the severity of a solar storm and how likely it is to happen, basing his predictions on the so-called Carrington event of 1859, which caused widespread disruption of communication systems as well as brilliant auroras as far south as the Caribbean. During the event, [Scientific American noted](http://www.scientificamerican.com/article.cfm?id=bracing-for-a-solar-superstorm" \t "_hplink), "People could read the newspaper by their crimson and green light. Gold miners in the Rocky Mountains woke up and ate breakfast at 1 a.m., thinking the sun had risen on a cloudy day."

#### New observations prove the current Solar Cycle will produce large solar flares

Wall 12 (Mike, writer for Space.com, Monster sunspot threatens to unleash powerful solar flares, May 8 2012, <http://www.foxnews.com/scitech/2012/05/08/monster-sunspot-threatens-to-unleash-powerful-solar-flares/>. Noparstak

**An enormous sunspot group has taken shape on the surface of the sun, hinting that our star may soon start spouting off some powerful storms**.The huge [sunspot](http://www.space.com/11842-photos-sunspots-sun-solar-cycle-weather.html" \t "_blank)external-link complex, known as AR 1476, rotated into Earth's view over the weekend. It measures more than 60,000 miles (100,000 kilometers) across, researchers said. Scientists with NASA's Solar Dynamics Observatory mission, a space-based telescope watching the sun, **dubbed the solar structure a "monster sunspot**" in a Twitter announcement.AR 1476 is big enough for amateur astronomers with decent equipment to spot from their backyards, weather permitting. (Warning: Never look at the sun directly with telescopes or the unaided eye. Special filters are required for safe solar viewing to avoid serious eye damage.)"With at least four dark cores larger than Earth, AR 1476 sprawls more than 100,000 km from end to end, and makes an easy target for backyard solar telescopes," the website [Spaceweather.com reported](http://spaceweather.com/" \t "_blank)external-link Monday (May 7).**Sunspots are temporary dark patches on the surface of the sun that are caused by intense magnetic activity. These structures sometimes erupt into [solar flares](http://www.space.com/12584-worst-solar-storms-sun-flares-history.html" \t "_blank)**external-link, which send high-energy radiation streaming into space.Solar **physicists classify flares into three main categories: C, M and X, with C being the least powerful and X the strongest**. X-class flares can cause long-lasting radiation storms in Earth's upper atmosphere and trigger radio blackouts. M-class flares can cause brief radio blackouts in the polar regions and occasional minor radiation storms, while C flares have few noticeable consequences.**AR 1476 has already proven quite active, firing off a number of C and M flares over the past few days**, including one Monday evening that seems to be an M1, one of the least powerful M flares, according to Spaceweather.com.**Big solar flares are often associated with coronal mass ejections (CMEs), massive clouds of solar plasma that streak through space at 3 million mph** (5 million kph) or more. **If these clouds hit Earth, they can wreak havoc, spawning geomagnetic storms that can disrupt GPS signals, radio communications and** power grids. CMEs also often super-charge the northern and southern lights, providing dazzling shows for skywatchers at high latitudes.Monday evening's eruption from AR 1476 apparently generated an Earth-directed CME, which should hit Earth sometime Wednesday morning (May 9) Eastern time, researchers said.After remaining surprisingly quiet from 2005 through 2010, **our star began waking up last year, spouting off numerous powerful flares and CMEs**.Most experts expect such outbursts to continue over the next year or so. **Solar activity waxes and wanes on an 11-year cycle, and scientists think the current one — known as Solar Cycle 24 — will peak in 2013**

#### Solar Roadways prevent a power grid blackout—it can’t be shut down.

Brusaw 12 (Scott, an electrical engineer with over 20 years of industry experience, including Director of Research and Development at a manufacturing facility in Ohio, and a voting member of NEMA, “Solar Roadways: A Real Solution”, http://www.solarroadways.com/smart.shtml. Noparstak)

**Our current power grid is based on centralized power stations**. Distribution of power is handled through transmission lines (overhead and underground), relay stations, and transformers. When a line goes down (ice, lighting, wind, tress, utility pole hit by car, etc.), everyone on the wrong end of the line loses power until the damage is repaired. **If a power station goes down, an entire section of the country goes dark. The Solar Roadways™ on the other hand, replaces all current centralized power stations** including coal- and nuclear-powered electricity generation plants. With the Solar Roadways™, the road becomes the power grid, eliminating the need for unsightly utility poles and relay stations. Power is generated everywhere - every road, parking lot, and driveway**. No more power outages, roaming or otherwise. This is "secure" energy: it can't be deliberately shut down. Not by terrorists, not by power companies,** it simply can't be shut down. For two weeks in July 2006, California baked in a heat storm of unrelenting, 100-degree-plus temperatures. Air conditioners ran day and night, overtaxing the electrical grid. On July 24, **when power demand hit more than 50,000 megawatts** – the highest level in state history – **transformers started failing**. Utility Pacific Gas and Electric was quickly overwhelmed, and **more than a million people lost power**, some for days. When the heat finally broke, it was blamed for 141 deaths. “Our grids today are more stressed than they have been in the past three decades,” says Kevin Kolevar, assistant secretary for electricity delivery and energy reliability at the Department of Energy. “If we don’t expand our capacity to keep up with an increase in demand of 40 percent over the next 25 years, **we’re going to see healthy grids become increasingly less reliable**.” Today, with the grid operating flat-out, any disruption – like the downed transmission line that sparked the 2003 blackout in the Northeast – can cripple the network. …since the 1990s much larger amounts of power have been moved over great distances. As a result, massive transfers are flowing over transmission lines built mostly by utilities for local use decades ago. Demand for electricity has increased steadily for decades, yet transmission lines that transport power from generation plants to customers have not been added or upgraded at the same pace. 20% Increase in demand for electricity (1999-2009) 7% Increase in transmission capacity (1999-2009) Result: large blackouts are growing in number and severity Utilities are operating ever closer to the edge of the stability envelope using 1960s-era controls. Estimates peg the economic loss from all U.S. outages at $70 to $120 billion a year. Although a big blackout occurs about once a decade, on any given day 500,000 U.S. customers are without power for two hours or more. Proposed federal legislation might encourage more investment, but even if transmission capacity is added, blackouts will still occur. The entire power grid has to be refurbished, because the existing control technology – the key to quickly sensing a small line failure or the possibility of a large instability – is antiquated. To remain reliable, **the grid will have to operate more like a fighter plane, flown in large part by autonomous systems that human controllers can take over if needed to avert disaster**. The United States uses 4 trillion kilowatt-hours of electricity each year, and the figure is expected to climb, outstripping our generating capacity. **Using networking technology to monitor - and react to – what’s happening in the grid at each moment can improve efficiency and prevent outages**. We still seem to thinking inside the box: the solution should not be to continue repairing an antiquated system of centralized power stations and distribution methods. Change is hard, but when the engine and transmission go out on your 40-year-old car, it's time to find a new vehicle. **Decentralizing the production of electricity can also make the grid more resilient** and save some of the 400 billion kilowatt-hours now lost while current flows through long-distance transmission lines to the nation’s households. About 60 percent of the energy used to generate electricity in power plants is wasted as heat. **The Solar Roadway™ is completely decentralized. Every Solar Road Panel™ can generate and pass electricity "down line" to homes and businesses. No loss to heat, no carbon footprint, and no spent fuel rods.** A self-healing smart grid can best be built if its architects try to fulfill three primary objectives. The most fundamental is real-time monitoring and reaction. An array of sensors would monitor electrical parameters such as voltage and current, as well as the condition of critical components. These measurements would enable the system to constantly tune itself to an optimal state. Each Solar Road Panel™ measures 12 feet (about 4 meters) by 12 feet and contains a microprocessor board for control, monitoring, and communications. That means that you have a microprocessor (a small computer) located every 12 feet in your power grid. It monitors everything that takes place within its 12 foot perimeter. It tracks voltage and current that it generates, uses, sends to or receives from neighboring Solar Road Panels™, etc. The second goal is anticipation. The system must constantly look for potential problems that could trigger larger disturbances. With a microprocessor located every 12 feet, we'll know when a problem first presents itself. Each of the neighboring (physically connected) Solar Road Panels™ communicate with each other. If one of them stops communicating, then something is wrong (panel is damaged from lighting strike, overturned truck, etc.). Neighboring panels will still be able to communicate send the information to a central control station. For example, let's say lighting strikes the road and does some significant damage: a hole is blown clean through a Solar Road Panel™ in the middle of an eight-lane highway. Let's go even deeper and say that a path to ground has been created and massive amounts of current attempt to drain through the damaged panel. Each side of each Solar Road Panel™ is equipped with a GFI (Ground Fault Interrupter), which would shut off as soon as a current surge was detected by the microprocessors in the undamaged neighboring panels. The lightning damaged panel would be electrically isolated and the surrounding panels could toggle the LEDs bordering the damaged panel. This would "paint" a square around the damaged panel to warn drivers of the danger. Oncoming drivers would be warned of the brief detour. No power outage - not even a disruption of service to any electrical customers. The third objective is isolation. If failures were to occur, the whole network would break into isolated “islands,” each of which must fend for itself. Each island would reorganize its power plants and transmission flows as best it could. This objective isn't necessary with the Solar Roadways™, albeit certainly possible. The roadway is the power plant and the transmission line. If a tanker truck blows up and severs a road completely in half, no power is lost anywhere (except for the damaged panels). Electricity will just go around on a different road, in the same manner that a vehicle would during a detour. Again, the undamaged neighboring panels would disconnect from the damaged panels and call the problem in. Government may be recognizing the need for action. The White House Office of Science and Technology Policy and the U.S. Department of Homeland Security recently declared a “self-healing infrastructure” as one of three strategic thrusts in their National Plan for R and D in Support of Critical Infrastructure Protection. **A self-healing transmission system would minimize the impact of any kind of terrorist attempt to “take out” the power grid**. The Solar Roadways™ can't be "taken out" - not by terrorists, not by utility companies, not by anyone. It provides a decentralized, secure, intelligent, self-healing power grid.

#### Collapse of the power grid causes nuclear meltdown—collapses - causes extinction. International Business Times 11(Solar Flare Could Unleash Nuclear Holocaust Across Planet Earth, Forcing Hundreds of Nuclear Power Plants Into Total Meltdowns, <http://au.ibtimes.com/articles/213249/20110914/solar-flare-could-unleash-nuclear-holocaust-across-planet-earth-forcing-hundreds-of-nuclear-power-pl.htm>. Noparstak)

What happens when there's no electricity? Imagine a world without electricity. Even for just a week. Imagine [New York](http://au.ibtimes.com/topics/detail/456/new-york/) City with no electricity, or Los Angeles, or Sao Paulo. Within 72 hours, most cities around the world will devolve into total chaos, complete with looting, violent crime, and runaway fires. But that's not even the bad news. Even if all the major cities of the world burned to the ground for some other reason, humanity could still recover because it has the farmlands: the soils, the seeds, and the potential to recover, right? And yet the real crisis here stems from the realization that once there is no power grid, all the nuclear power plants of the world suddenly go into "emergency mode" and are forced to rely on their on-site emergency power backupsto circulate coolants and prevent nuclear meltdowns from occurring. And yet, as we've already established, these facilities typically have only a few hours of battery power available, followed by perhaps a few days worth of diesel fuel to run their generators (or propane, in some cases). Did I also mention that half the people who work at nuclear power facilities have no idea what they're doing in the first place? Most of the veterans who really know the facilities inside and out have been forced into retirement due to reaching their **lifetime limits** of on-the-job radiation exposure, so most of the workers at nuclear facilities right now are newbies who really have no clue what they're doing. There are 440 nuclear power plants operating across 30 countries around the world today. There are an additional 250 so-called "research reactors" in existence, making a total of roughly 700 nuclear reactors to be dealt with ([http://www.world-nuclear.org/info/i...](http://www.world-nuclear.org/info/inf01.html" \t "_blank)). Now imagine the scenario: You've got a massive solar flare that knocks out the world power grid and destroys the majority of the power grid transformers, thrusting the world into darkness. Cities collapse into chaos and rioting, martial law is quickly declared (but it hardly matters), and every nation in the world is on full emergency. But that doesn't solve the really big problem, which is that you've got700 nuclear reactors **that can't feed power into the grid** (because all the transformers are blown up) **and yet simultaneously have to be fed a steady stream of emergency fuels to run the generators the keep the coolant pumps functioning**. How long does the coolant need to circulate in these facilities to cool the nuclear fuel? **Months.** This is also the lesson of Fukushima: You can't cool nuclear fuel in mere hours or days. It takes months to bring these nuclear facilities to a state of cold shutdown. And that means **in order to avoid a multitude of Fukushima-style meltdowns from occurring around the world, you need to truck diesel fuel, generator parts and nuclear plant workers to every nuclear facility on the planet, ON TIME, every time, without fail, for months on end**. Now remember, **this must be done in the middle of the total chaos** breakdown of modern civilization**, where there is no power**, where law enforcement and emergency services are totally overrun, where people are starving because food deliveries have been disrupted, and when looting and violent crime runs rampant in the streets of every major city in the world. Somehow, despite all this, you have to run these diesel fuel caravans to the nuclear power plants and keep the pumps running. Except there's a problem in all this, even if you assume you can somehow work a logistical miracle and actually deliver the diesel fuel to the backup generators on time (which you probably can't). The problem is this: Where do you get diesel fuel? Why refineries will be shut down, too from petroleum refineries. Most people don't realize it, but petroleum refineries run on electricity. Without the power grid, the refineries don't produce a drop of diesel. With no diesel, there are no generators keeping the coolant running in the nuclear power facilities. But wait, you say: Maybe we could just acquire diesel from all the gas stations in the world. Pump it out of the ground, load it into trucks and use that to power the generators, right? Except there are other problems here: How do you pump all that fuel without electricity? How do you acquire all the tires and spare parts needed to keep trucks running if there's no electricity to keep the supply businesses running? How do you maintain a truck delivery infrastructure when the electrical infrastructure is totally wiped out? Some countries might be able to pull it off with some degree of success. With military escorts and the total government control over all fuel supplies, a few nations will be able to keep a few nuclear power facilities from melting down. But here's the real issue: There are 700 nuclear power facilities in the world, remember? Let's suppose that in the aftermath of a massive solar flare, the nations of the world are somehow able to control half of those facilities and nurse them into cold shutdown status. That still leaves roughly 350 nuclear facilities at risk. Now let's suppose half of those are somehow luckily offline and not even functioning when the solar flare hits, so they need no special attention. This is a very optimistic assumption, but that still leaves 175 nuclear power plants where all attempts fail. Let's be outrageously optimistic and suppose that a third of those somehow don't go into a total meltdown by some miracle of God, or some bizarre twist in the laws of physics. So we're still left with **115 nuclear power plants** that "go Chernobyl." Fukushima was one power plant. **Imagine the devastation of 100+ nuclear power plants, all going into meltdown all at once across the planet**. It's not the loss of electricity that's the real problem; it's the **global tidal wave of invisible radiation** that blankets the planet, permeates the topsoil, irradiates everything that breathes and delivers the final crushing blow to human civilization as we know it today. Because if you have **100 simultaneous global nuclear meltdowns**, the tidal wave of radiation will make farming nearly impossible for years. That means no food production for several years in a row. And that, in turn, means anear-totalcollapse of the human population on our planet. How many people can survive an entire year with no food from the farms? Not one in a hundred people. Even beyond that, how many people can essentially **live underground** and be safe enough from the radiation that they can have viable children and repopulate the planet? It's a very, very small fraction of the total population.

#### State regulated requirements fail, only standardization through a single system soles power crashes and interferences

Moersdorf 12 (Gerry, employed at ACScout, company that designs AC monitoring devices for special applications, "Measuring the Quality and Reliability of Electric Service", http://www.acscout.com/servlet/Page?template=reliabilityofelectricserviceIt isn’t easy.

**State regulatory bodies set distribution reliability requirements.** And **since every state has developed different reliability** reporting **requirements, it’s almost impossible to compare reliability on a state-by-state or national level**. Moreover, **almost 33%** **of** the 50 **states don’t have reliability standards and are currently not considering any**. A power industry standard, IEEE Std. 1366-2003 (Measuring Performance of Electrical Power Distribution Systems), was created to foster uniformity in the development of distribution service reliability indices. The idea is that **standardization will lead to better comparability**. However, there’s still a long way to go because almost half of the 50 states are either not measuring the performance of electrical distribution, or are reporting but not using standardized indices such as IEEE Std. 1366-2003 to compile those reports. Even though electric companies have different distribution system configurations, what you can expect is that standard voltage and frequency falls within ANSI C84.1-1995 Table 1 voltage range of 106V to 127V (on a 120V basis) and a frequency range of 59.3Hz to 60.5Hz. How can you know whether the power flowing into your equipment falls outside these norms? **How will you know whether your equipment crashed because of “normal” power system operation, localized interference, or because of deficient service that’s the utility’s responsibility**? Several utilities, such as Southern California Edison and Pacific Gas & Electric, offer a “Service Guarantee” that relates to service restoration and notification of planned outages on their websites. I strongly recommend that you take the time to check your utility’s website to learn what your utility is willing to guarantee in terms of service quality and reliability. PG&E, for example, explicitly states that “YOU are responsible for providing any devices needed to protect your sensitive equipment that cannot operate within the voltage variations of PG&E’s normal electrical service. PG&E is not liable for damage to your equipment or any other damage from variation in service voltage that are allowable under this rule.”

## Contention Three—Space

#### The Los Angeles Air Force Base depends on the power grid—it’s the US military’s only space operations center and is critical to success

Miller 11 (Andrew, vice president, external communications, Integral Systems Inc., "Orbital Sciences Corporation Awards Integral Systems Contract", April 20 2011, <http://www.integ.com/Press/2011/4-20-2011OrbitalSciencesCorporationAwardsIntegralSystemsContract.pdf>. Noparstak)

Space and Missile Systems Center Sponsored Study to Address the Feasibility of Expanding the Use of Commercial SATCOM for Specific Military Applications. Integral Systems, Inc., (Nasdaq:ISYS - News) announced today that Orbital Sciences Corporation (NYSE:ORB - News) has awarded the company a contract to support the Space and Missile Systems Center (SMC) Broad Agency Announcement (BAA) for Commercial SATCOM Architecture Options. Under the terms of the contract, **Integral Systems will support** Orbital in overall **ground interface definition, ground integration and network management for wideband communications systems**. Integral Systems' work on the Command and Control System-Consolidated (CCS-C) program makes it uniquely suited to provide its expertise to the U.S. Air Force (USAF). Managed by Integral Systems, **the CCS-C program is** the U.S. military's only operational Commercial Off-the-Shelf (COTS)-based, **multi-mission space operations center**. Based on its experience, Integral Systems will ensure that architectures offered to the USAF include the integration of COTS-based products to prevent continued reliance on expensive proprietary control centers. "**The use of commercially available space technologies to increase operational and situational awareness is critical to strategic and tactical mission success**," said Robert Wright, Senior Vice President and General Manager, Military and Intelligence Group for Integral Systems. "In conjunction with Orbital Sciences Corporation, we will address how the Air Force leverages commercial SATCOM technologies and processes to ensure the warfighter has access to the secure, accurate and reliable military communications they need." SMC solicited BAA proposals to study the feasibility of using commercial satellite systems and components with minor modifications to meet selected military communications needs at military frequencies. SMC plans to use the study results to help the U. S. Government assess the ability of commercial SATCOM to provide feasible architectural solutions (i.e., cost, schedule, performance, acquisition approach) that can provide operationally relevant capabilities to the warfighter in the 2016 to 2025 timeframe, with an authority to proceed as early as Fiscal Year 2012. The SMC, a subordinate unit of the Air Force Space Command at Peterson Air Force Base (AFB), Colo., is the center of technical excellence for researching, developing and purchasing military space systems. **The center is also responsible for on-orbit check-out, testing, sustainment and maintenance of military satellite constellations** and other DoD space systems. **The center is located at Los Angeles** AFB in El Segundo, Calif., four miles south of Los Angeles International Airport.

#### Space is key to every aspect of hegemony

Fernandez 4 (Adolfo, National Defense Fellow, foreign affairs, defense, and trade division, "Military Role in Space Control: A Primer", Sept 23 2004, <http://www.fas.org/man/crs/RL32602.pdf>. Noparstak)

Military space control seeks to preserve the military advantage the U.S. military gains from space. Whether in the form of **global communications**, Intelligence Surveillance and Reconnaissance (**ISR)**, **navigation signals, meteorological information**, or **missile warnings**, the **most important commodity** offered **from space may be information**. On March 25, 2004, during his testimony to the Senate Subcommittee on Strategic Forces, Retired Vice Admiral Arthur K. Cebrowski, Director of Force Transformation, Office of the Secretary of Defense, stated, Transformation across the force is happening much faster than we expected when we announced the journey just 28 months ago. Not just a concept and not just action in the future, transformation is happening today. It’s happening due in large part to information and power derived from our vital space capabilities.7 Beginning with the Persian Gulf War in 1991, **there has been a steady infusion of space capabilities into virtually all aspects of U.S. military operations** — **navigation, communications, meteorology, missile warning, and targeting information management**.8 The most prominent example **includes the use of** Global Positioning System (**GPS)-guided precision munitions**. In 1999, **GPS**-guided weapons **demonstrated all-weather precision strike capability** during Operation Allied Force in Serbia and in Kosovo. **During the Afghanistan conflict** in 2001, **precision munitions comprised two-thirds of all the bombs dropped** during the first two months of the war. Of those precision munitions, **64 percent were GPS-guided** Joint Direct Attack Munitions.9 Military reliance on space also extends to commercial and civil space resources. According to Army General Joseph Cosumano, Commander of U.S. Army Space and Missile Defense Command and Army Space Command, **during Operation Iraqi Freedom, over 70 percent of military communications were provided by commercial satellites**.10 According to a threat analysis from the U.S. Naval Postgraduate School, U.S. military dependence on space systems may continue to outpace DOD budget and production capability. The analysis concludes that DOD may have to continue looking to the commercial and civil sectors to satisfy a portion of its space service requirements.11

#### Specifically communication to military operations in the Middle East—there is no alternative

TS2 No Date (Worldwide satellite communications, ttp://www.ts2.pl/en/Order-form-for-soldiers-in-Iraq. Noparstak)

**It would never be possible to carry out military operations without communications**. Hence, military applications contributed to development of telecommunications. **The biggest advantage** **of satellite communications** **used for military purposes** **is its coverage with relatively high capacity**. Currently used technology enables transferring any amount of data at a speed of up to several dozen Mb/s in both ways the access is available by leasing a part of band in a chosen transponder. **Contemporary military operations, peacekeeping and stabilization missions require** from the armed forces to take **actions in unknown and very often distant areas**. **An example** may be **the mission of the Armed Forces in Iraq or Afghanistan.** Military operations are carried out in vast areas with poor telecommunications infrastructure. **In such circumstances only modern systems of satellite communications may provide fast, reliable, interference- and interception-resistant information transfer in command centers, operating units and other sub-units** (logistic, engineering, etc**.). Due to the way the Armed Forces are involved in mission operations on other continents in the areas of poor telecommunications infrastructure, there is practically** no alternative **to the satellite communications.**

#### Military operations in the Middle East are critical to containing inevitable spillover—three reasons

Terrill 8 (Andrew, Professor of National Security Affairs, served as a Middle East nonproliferation analyst for the International Assessments Division of the LLNL, retired U.S. Army Reserve lieutenant colonel and Foreign Area Officer in the Middle East, published in numerous academic journals on topics including nuclear proliferation, the Iran-Iraq War, Operation Desert Storm, he holds a B.A. from California State Polytechnic University and an M.A. from the University of California, Riverside, both in Political Science, also holds a PhD in International Relations from Claremont Graduate University, "Regional Spillover Effects Of The Iraq War", December 2008, <http://www.dtic.mil/dtic/tr/fulltext/u2/a492485.pdf>. Noparstak)

**It is inevitable that civil unrest and other problems in Iraq would have spillover effects for other regional countries**. **These problems will continue** even if the situation in Iraq steadily improves and will become especially problematic if the situation in Iraq deteriorates. Virtually every responsible person dealing with Iraq acknowledges that gains in that country are fragile and reversible and that ultimately the Iraqis and not the Americans will decide the Iraqi future. **It is**, therefore**, vital that the United States prepares for spillover problems beyond Iraq’s borders**, and that this is done in the knowledge that the road to a unified and stable Iraq remains long and uncertain. Even temporary and reversible disasters in Iraq can have catastrophic results for U.S. interests in the Middle East if efforts to address Iraqi spillover are not adequate. The following policy recommendations are therefore offered with this situation in mind. 1. **U.S. civilian and military planners need to remain sensitive to the possibility that the most dangerous spillover threat from Iraq is ethnic and sectarian conflict, and if such spillover occurs in any dramatic way, it may be catastrophic for U.S. interests**. Sectarian hatreds can lead to civil unrest and undermine the stability of countries beyond Iraqi borders. Moreover, the United States must accept the possibility of a long-term **struggle between Iraq’s Sunnis and Shi’ites which intensifies dramatically once U.S. forces leave Iraq**, regardless of how many years they remain and attempt to “fix” the political system. The potential for such problems spreading is directly 62 related to the discontent Middle East Shi’ites may feel in their home countries because of unfair political and economic treatment. U.S. leadership correspondingly needs to recognize that while this may be the wrong time to push for full democracy in the larger Middle East, **it is the right time to push for reform including the acceptable treatment of Shi’ite citizens** by Arab countries. Reducing or eliminating discrimination against Shi’ites in Sunni Arab countries is an important component of any strategy to contain sectarian spillover. 2. The United States **needs to consider carefully the dangers that sectarian disorder may bring to Iraq’s neighbors**, even in the case of those countries which are U.S. adversaries. If Syria collapses into chaos, this development will not serve U.S. interests. A decrepit Ba’ath regime, however unpleasant and troublesome, is a better option for the present than a Syrian civil war or the extreme and energized Islamist regime that could emerge from such chaos. Ba’athism in Syria, in general, may not have much of a future. At this time, it is probably most useful to take advantage of Syrian isolation and weakness to seek continuing gains in Syrian behavior towards Iraq. 3. The United States needs to let its Iraqi friends and allies know that they will be welcomed into the United States should they face disaster in Iraq rather than consigned to be refugees in some other part of the world. Such policies do not mean that we are facing and preparing for defeat in Iraq. Rather, they would be meant to reassure our Iraqi supporters that we will stand by them regardless of the problems that they might face. Like all forms of insurance, this approach is meant to be comforting and empowering to our Iraqi 63 supporters. The United States should also continue and expand programs to allow actively pro-American Iraqis and their families into the United States and then allow the heads of household to return to Iraq to work with U.S. forces if they are willing and can make a useful contribution to building the new Iraq. The U.S. willingness to protect the families of such supporters in this way builds good will and enhances U.S. ability to recruit especially valuable supporters. While many such families would have permanent resident status, they would probably be interested in returning to Iraq once they felt safe in doing so. 4. The U.S. leadership needs to understand that foreign terrorists and funds may return to Iraq after being driven out unless Sunni tribal groups in Western Iraq can maintain good relations with each other and good relations with the Baghdad government. The Awakening groups therefore cannot be precipitously abolished thereby repeating the same type of mistake as disbanding the Iraqi Army in 2003. Zero-sum thinking on the part of key Iraqi leaders could lead to intersectarian and intrasectarian problems that plunge Western Iraq into renewed chaos. If Iraqi leaders are determined to seek political advantages by plunging the country into a downward cycle, U.S. forces will be able to do very little about it. Terrorist infiltration from abroad would again become a larger problem, and the danger presented to the region by Iraq trained terrorists would be increased. 5. **The United States needs to take whatever steps are necessary to minimize the ability of al-Qaeda members to infiltrate Iraq at any future point, but especially at the beginning of that stage where the Iraqi government is seeking to survive and expand its authority** following the eventual departure of U.S. 64 troops. This program to help Iraq may involve limited cooperation with Syria and under some circumstances, Iran. Such cooperation should be limited but could also be used to set the stage for a discussion of other problems including nuclear weapons in Iran and problems with support for terrorist groups by both countries. 6**. The United States must do all it can to maintain intelligence data bases that reflect the movements of foreign fighters who have left Iraq after gaining valuable experience** there and must keep this need in mind when developing policies toward all Arab countries including Syria. In this regard, it is again doubtful that either U.S. or Israeli interests would be well served by regime change in Damascus that led to an almost totally anarchic situation such as that found in Iraq as late as 2006. Intelligence cooperation with the Syrians should be considered if the Syrian regime is willing to provide useful intelligence on an ongoing basis, and if the price that the Syrians want for such cooperation is not unacceptably high.

#### Uncontained spillover leads to nuclear war—cold war theory doesn’t apply to the Middle East

Contrarian 12 (Glenn, retired Navy member and common contributer to BC Politics, an online magazine covering many things including politics, all submitted work is peer reviewed and edited for content, "Nuclear War Is Becoming Increasingly Likely in the Middle East", March 5 2012, <http://blogcritics.org/politics/article/nuclear-war-is-becoming-increasingly-likely/page-2/>. Noparstak)

I don't like to be an alarmist, but pieces are starting to fall together in a particularly uncomfortable way, and we here in the West are the last to see it. We're all familiar with the "Arab Spring" that has worked its way across **the Middle East** and North Africa, and of its latest iteration in Syria which **threatens to erupt into civil wa**r. Now we might say, "So what? Another civil war in the Middle East that doesn't affect us." Oh, but if the puppets who are pulling the strings lose control, **the result will** indeed **affect all of us**. We would be wise to pay attention, because we may be approaching a showdown between the Shi'a and the Sunni Muslims of the world. Most Americans have at one point or another heard the terms "Sunni" and "Shi'a" in news stories about the Middle East, but few of us really understand the meaning. Even those of us who are more familiar with Islam have a tendency to equate the Sunni/Shi'a schism with the Catholic/Protestant schism of mainstream Christianity. Even President [George W. Bush,](http://www.rawstory.com/news/2006/Ambassador_claims_shortly_before_invasion_Bush_0804.html" \t "_blank) just two months before America invaded Iraq was unaware that there are two major sects of Islam and so could not have imagined the gift he was handing Shi'a Iran by toppling Saddam Hussein, whose government was comprised mostly of minority Sunnis. No, **the Islamic schism is much deeper and more prone to violence** than anything mainstream Christianity has faced since the days of the Spanish Main. In fact, Abu Musab al-Zarqawi, the one time second in command of al-Qaeda (which is a hard-line Sunni group) was exploring ways to draw America into a [war with Shi'a Iran](http://en.wikipedia.org/wiki/Abu_Musab_al-Zarqawi" \l "Attempts_to_provoke_US_attack_on_Iran" \t "_blank). Now it looks as if **the conflict between the Shi'a** supported government **and the Sunni** backed people in Syria **is beginning to take the form of a [direct confrontation](http://www.mcclatchydc.com/2012/03/02/140681/syria-splits-along-sectarian-lines.html" \t "_blank) between Shi'a and Sunni Islam as a whole**. Islamic scholar Vali Nasr is a former State Department adviser who formerly taught at the U.S. Naval Postgraduate School, and who now teaches at Tufts University's Fletcher School of Law and Diplomacy. He points out in the article, "This portends very bad things for the region. **If this gets worse and becomes a full-scale civil war...this will spill over. Other countries are vulnerable...and could end up having a bigger, broader conflict in the Gulf between Saudi Arabia and Iran**." To make matters worse, the [struggle for authority](http://www.insideiran.org/media-analysis/conflict-between-ahmadinejad-and-khamenei-intensifies/" \t "_blank) between Iran's President Ahmadinejad and Supreme Ayatollah Khamenei has ended badly, for the Ayatollah's party now [controls enough seats](http://www.nytimes.com/2012/03/05/world/middleeast/iran-elections-deal-blow-to-ahmadinejad-and-the-presidency.html" \t "_blank) to eliminate the office of the president entirely and enable the Ayatollah to rule the nation by fiat. As bad as the western media made Holocaust denier Ahmadinejad look, he was actually the more moderate of the two. But now there is no one left to act as a moderating influence on the Ayatollah, and if his [inflammatory remarks](http://www.alaskadispatch.com/article/iran-wont-retreat-nuclear-program-ayatollah-khamenei-says" \t "_blank) are any indication, it does not bode well for maintaining peace in the region. **The final piece of this** particular **conundrum is Iran's nuclear power program**, of which the previous reference shows Ayatollah Khamenei to be an ardent supporter. As I have stated on Blogcritics for years, despite any claim otherwise, Iran is striving as hard as they can to develop a nuclear weapon; not to defend against America or Israel (for we are the excuses, not the reason), but **to counterbalance the nukes possessed by Sunni Pakistan**. **We've all watched this death spiral before, in the Cold War. But cooler heads prevailed and the human race survived**, perhaps because the cooler heads understood that the very survival of the human race depended on maintaining the peace. **Such is not the case with the Sunni and the Shi'a.** **Not only do they have no such fear that the whole world would pay the ultimate price for their folly, but both sects are absolutely sure that God will bring them victory**. We can only hope that here, too, cooler heads will prevail. Otherwise, **the only safe place in the Middle East will be Mecca**, for neither side would dare to destroy their holy city. If worse comes to worst, I would expect that the Sunnis would prevail, for not only do the Sunnis comprise the significant majority of the population and wealth of the world's Islamic nations, but the West, and particularly America, may well be drawn in on Saudi Arabia's side; too much of our economic national interest is tied up therein. If this conflict does come to pass, however, one can only hope that the world (including America's religious right) takes it as a hard-learned lesson of the wisdom of the separation of Church and State.

## Contention Four: Solvency

#### DOE already funded the project’s upstart, but the aff needs more funding to cause nationwide implementation—non-uniques DAs

Covert 9(Adrian, writer for for POPSCI, "Solar Panels Built Into Roads Could Be the Future of Energy", Aug 27 2009, <http://www.popsci.com/scitech/article/2009-08/solar-panels-built-roads-could-be-future-energy/>. Noparstak)

**The Department of Energy just gave $100,000 to upstart company Solar Roadways, to develop** 12-by-12-foot solar panels, dubbed "**Solar Roads,**" that can be embedded into roads, **pumping power into the grid**. The panels may also feature LED road warnings and built-in heating elements that could prevent roads from freezing.Each Solar Road panel can develop around 7.6 kwh of power each day, and each costs around $7,000. **If widely adopted, they could realistically wean the US off fossil fuels**: a mile-long stretch of four-lane highway could take 500 homes off the grid. **If the entire US Interstate system made use of the panels, energy would no longer be a concern for the country**.In addition, every Solar Road panel has its own microprocessor and energy management system, so if one gives out, the rest are not borked. Materials-wise, the top layer is described as translucent and high-strength. Inhabitat says it's glass, which seems odd, especially since Solar Roadways claims the surface provides excellent traction. The base layer under the solar panel routes the power, as well as data utilities (TV, phone, Internet) to homes and power companies. Still, **this is a ways away from actual implementation**, seeing as a prototype has yet to be built. But we can be excited, right?

#### Solar panels have already been created, are competitive with asphalt, and provide enough energy to power the entire world

McKendrick 10 (Joe, an independent analyst who tracks the impact of information technology on management and markets. He is the author of the SOA Manifesto and has written for Forbes, ZDNet and Database Trends & Applications, "Pave this: replace asphalt on roads with solar panels, power the nation", Aug 6 2010, <http://www.smartplanet.com/blog/business-brains/pave-this-replace-asphalt-on-roads-with-solar-panels-power-the-nation/9178>. Noparstak)

Here’s an idea that could provide the United States with all the solar power it needs, while also helping to fix a large part of our crumbling infrastructure: **pave our 25,000 square miles of roadways with intelligent solar panels. A road “that pays for itself**,” its designers propose. Is this a feasible idea, or something akin to trying to build a bridge across the Atlantic? There may be some economic justification. **Liquid asphalt, a petroleum-based derivative, now costs close to $1,000 a ton, while asphalt itself is still under $100 a ton**, says Scott Brusaw of [Solar Roadways](http://www.solarroadways.com/" \t "_blank), an engineer proposing the idea. “**We can’t keep building asphalt roads, doing the same thing**… its an antiquated system we’ve been doing too long,” he says. “**Let’s move on and leave the fossil fuels behind us**.” **Solar panels, operating at just 15 percent efficiency, installed as roadway surfaces within the 25,000 square miles of existing roads in the lower 48 states, would be capable of producing “three times as much electricity that we produce on an annual basis — almost enough to power the entire world**,” Brusaw says. The prototypes for Solar Roadways were funded by a research award from the US Department of Transportation, which solicited ideas for an “intelligent pavement” that could generate power and pay for itself. Brusaw and his team built a 12′ by 12′ solar road panel prototype, along with a 3′ by 3′ LED-lit “crosswalk” panel. The smaller panel could be used to mark and illuminate the edges of roads and other hazards, Brusaw says. “Roads are collecting heat anyway,” Brusaw says, adding that “**the technology behind it has already been done today**.” Can a sheet of glass withstand pounding by two-ton cars, trucks, and buses? This is possible, Brusaw says, as “**glass can have as high of strength as steel**.” There are other issues to be addressed, he adds, noting that driving on glass “has got to have the same traction as asphalt,” as well as be shatterproof and glareproof.

### AT: States CP

#### --Power Grid

#### State regulated requirements fail, only standardization through a single system soles power crashes and interferences

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#### Federal government should control power grid expansion—state governments struggle for power

Stone 3 (Brad, alumnus of University school and Columbia University, technology correspondent for the New York Times and Newsweek, "How To Fix The Grid", Aug 24 2003, http://www.thedailybeast.com/newsweek/2003/08/24/how-to-fix-the-grid.html

If the electricity grid is our nation's circulatory system, then America desperately needs a triple bypass. **Economic growth and the proliferation of computers** and other digital devices **have strained power arteries to the max**. **Meanwhile**, utilities and **state governments** **argue** futilely over **who should fix the problem**. Here are a few ideas for emergency surgery. STOP THE POWER STRUGGLE. Thanks to deregulation of the energy markets over the last 10 years, which allows local utilities to sell electricity anywhere they can find a buyer, electrons produced in Michigan now power microwaves in New York. But the **grids are still administered on a state-by-state basis**. That's **because states don't want to give up control to the Feds**--they worry about big towers in their communities and new plants sullying their environment--which stops new transmission lines from being built. **State and federal commissions ought to meet jointly to consider upgrades of the grid across state lines**. **The** Federal Energy Regulatory Commission (**FERC**) **should step in to mandate the construction of reliable new lines**, like the proposed Arrowhead-Weston line between Wisconsin and Minnesota. "**If the highway system is planned on a federal level, why shouldn't the Feds also direct expansion of the power grid?**" asks Elliot Roseman, a principal at energy firm ICF Consulting.

#### Electric transmission lines were the pilot programs to demonstrate federal cooperation dealing with the power grid

Daly 11 (Matthew, newswriter at Associated Press, Obama to step up power line projects, Oct 5 2011, <http://news.yahoo.com/apnewsbreak-obama-step-power-line-projects-071117954.html>. Noparstak)

WASHINGTON (AP) — The **Obama administration** moved Wednesday to speed up **permitting** and **construction of** seven proposed **electric transmission lines** in 12 states**, saying the projects would** create thousands of jobs and **help modernize the nation's power grid**. The projects **are intended to serve as pilot demonstrations of streamlined federal permitting and improved cooperation among federal, state and tribal governments**. The projects will provide more than 2,500 miles of new transmission lines in Arizona, Colorado, Idaho, New Mexico, Nevada, Oregon, Utah, Wyoming, New Jersey, Pennsylvania, Minnesota and Wisconsin. In all, the projects are expected to create more than 10,000 direct and indirect jobs, help avoid blackouts, restore power more quickly when outages occur and reduce the need for new power plants, officials said. "**To compete in the global economy, we need a modern electricity grid**," Energy Secretary Steven Chu said Wednesday in a statement. "An upgraded electricity grid will give consumers choices while promoting energy savings, increasing energy efficiency and fostering the growth of renewable energy resources." Interior Secretary Ken Salazar said the seven power lines being expedited under the pilot program will serve as important links across the country to increase the capacity and reliability of the nation's power grid. "This is the kind of critical infrastructure we should be working together to advance in order to create jobs and move our nation toward energy independence," he said. David DeCampli, president of PPL Electric Utilities, and Ralph LaRossa, president of Public Service Electric and Gas. Co., who are teaming up to build a 145-mile transmission line in Pennsylvania and New Jersey, applauded the administration's efforts. Their project and others should ensure that high-priority electric infrastructure projects are built and placed in service in a timely manner, the power executives said. Pam Eaton, deputy vice president for public lands at The Wilderness Society, also hailed the project. "Building responsibly sited power lines to access world-class renewable resources can put thousands of Americans to work, bring cost-effective clean power to people who need it, and help some of the rural counties in the West hardest hit by the economic downturn," she said.

#### --Highways

#### A. Highway Trust Fund

ARTBA, 12 – American Road and Transportation Builders Association (Revised March 2012, “HIGHWAYS”, <http://www.artba.org/advocacy/government-affairs/policy-statements/highways/>, KOCHMAN)

**There will always be a need for federal investment in the nation's highway** and bridge **system.**

ARTBA supports permanent **extension of the federal Highway Trust Fund's** expenditure authority-and **funding** sources to support it-to **ensure that adequate financial resources are available to meet the federal role without causing disruption in state highway improvement programs.**

#### B. Multiple reasons – coordination, national defense, and cost-effective

ARTBA, 12 – American Road and Transportation Builders Association (Revised March 2012, “HIGHWAYS”, <http://www.artba.org/advocacy/government-affairs/policy-statements/highways/>, KOCHMAN)

ARTBA believes **the federal government has a major role to play in the development and maintenance of an efficient national highway** and bridge **network for the following reasons:**

The vast majority of Americans and U.S. businesses choose to use motor vehicles as their preferred means of transportation.

The U.S. Constitution empowers the Congress to regulate commerce among the states and with other nations.

**A national, coordinated system of well-maintained highways** and bridges **with intermodal linkages must exist in support of interstate commerce and commercial export.**

**The Constitution also requires the federal government to provide for the national defense. To meet this responsibility, the federal government should ensure that efficient transportation facilities are available to expedite emergency military and industrial mobilizations and support civil defense needs and activities.**

The efficient movement of people and commercial goods across state lines is key to sustaining a strong national economy and maintaining a high quality of life for all Americans.

Highway safety is a major national public health issue.

For these reasons, ARTBA believes the federal role should include adequate provision of financial, technical and research assistance to the states for highways and bridges. Working in full cooperation with the states, **the federal government should also assume the lead role in developing and promoting uniform standards and guidelines for highway** and bridge **design, maintenance and operations. Consistent and predictable federal funding is essential to operating orderly and cost-effective state highway improvement programs.**

#### C. Solves anti-highway laws

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**Federal policymakers should recognize that America will need additional highway capacity to meet transportation demand driven by changing demographics and public and business needs.**

**Federal surface transportation law should not be used as a tool to advance anti-highway and anti-growth social policies. Provisions of existing law** that **support these agendas** should be eliminated.

#### D. Cost effectiveness

**ARTBA, 12** – American Road and Transportation Builders Association (Revised March 2012, “HIGHWAYS”, <http://www.artba.org/advocacy/government-affairs/policy-statements/highways/>, KOCHMAN)

ARTBA believes **Congressional authorizations for the Federal-aid Highway Program should be set at a level that will ensure full and timely utilization of all revenues collected for the Highway Trust Fund**, including any unexpended balances in the fund. The annual obligation for the highway program should at least match the level of highway user fee revenue flowing into the Highway Account of the Highway Trust Fund.

**Consistent and predictable federal funding is essential to operating orderly and cost-effective state highway improvement programs.**

#### E. NHS

ARTBA, 12 – American Road and Transportation Builders Association (Revised March 2012, “HIGHWAYS”, <http://www.artba.org/advocacy/government-affairs/policy-statements/highways/>, KOCHMAN)

**The Intermodal Surface Transportation Efficiency Act** of 1991 (**ISTEA**) **set in motion the framework for developing a strategic federal investment program designed to upgrade** those existing **highways** and bridges that serve a national interest. **The law directed the U.S. Secretary of Transportation to designate**, in consultation with the states, **a 165,871-mile "National Highway System"** (**NHS**) **to serve as the focal point for future federal highway** and bridge capital **investments**. The NHS designation became law in November 1995.

**The NHS helps focus future federal highway funding on international and Interstate routes**, as well as on roads that serve major population centers, ports, airports, and international border crossings. While **the NHS includes** only four percent of the nation's existing highway mileage, it is the **mileage that carries 44.7 percent of total vehicle-miles traveled in this country including 80 percent of all tourist travel and 75 percent of all heavy truck travel.**

Specifically, the NHS includes the 46,937-mile Interstate Highway System, existing major urban and rural arterials, the 15,000-mile defense strategic highway network, and strategic intermodal highway connectors.

**The NHS reflects the major demographic and travel changes that have occurred in this country** since the designation of the Interstate Highway System over 50 years ago. Highway travel in the U.S. has increased as the population has grown, as more women have entered the workplace, and as jobs have been created outside of urban centers.

**Travel on the federal-aid system has risen more than 111 percent since 1980. The greatest growth, over 199 percent, occurred on segments of the Interstate Highway System** in urban areas. Travel on all roads and streets has increased more than 98 percent since 1980.

### AT Heg Bad

#### Military reliance on fossil fuels is the root cause of conflict and military overstretch.

Erwin, 2006 (Sandra I., “Energy Conservation Plans Overlook Military Realities,” National Defense Magazine, September,

[http://www.nationaldefensemagazine.org/issues/2006/September/DefenseWatch.htm](http://www.nationaldefensemagazine.org/issues/2006/September/DefenseWatch.htm" \t "_blank)

, accessed 7/7, JDC)

Are skyrocketing oil prices just a temporary drain on the U.S. economy or a lasting national security threat? If one is to draw conclusions from a recent stream of Pentagon policy directives, studies and congressional rhetoric, the Defense Department will soon have to get serious about taming its gargantuan appetite for fuel, most of which is imported from the volatile Middle East. “The fact is that nearly **every military challenge we face is either derived from or impacted by** one thing: **our reliance on fossil fuels and foreign energy sources** ,” says Rep. Steve Israel, D-N.Y., who co-founded a “defense energy working group” with Rep. Roscoe Bartlett, R-Md., and former CIA Director James Woolsey. “**In a world where we borrow money from China to purchase oil from unstable Persian Gulf countries to fuel our Air Force planes that protect us against potential threats from these very countries, it’s high-time to make the choices and investments necessary to protect our country**,” Israel says. When oil prices began to surge, Defense Secretary Donald Rumsfeld issued one of his trademark “snowflake” memos asking aides to come up with energy-saving schemes and technologies, such as hybrid vehicles and innovative power sources. In truth, it is hard to see how Rumsfeld’s directive could change **the reality of a military that mostly operates guzzlers, and has no tangible plans to change that** . Just two years ago, the Environmental Protection Agency gave the Pentagon a “national security exemption” so it can continue to drive trucks with old, energy-inefficient engines that don’t meet the emissions standards required for commercial trucks. The Army once considered replacing the mother of all fuel-gorgers, the Abrams tank engine, with a more efficient diesel plant. But the Army leadership then reversed course because it was too expensive. Most recently, the Army cancelled a program to produce hybrid-diesel humvees, and has slowed down the development of other hybrid trucks in the medium and heavy fleets. The Air Force has been contemplating the replacement of its surveillance, cargo and tanker aircraft engines, but the project was deemed too costly, and not worth any potential fuel savings. Subsequent to Rumsfeld’s 2005 snowflake, a number of military and civilian Pentagon officials have been eager to publicize various science projects aim ed at energy conservation , such as research into synthetic fuels, biofuels, hydrogen fuel cells, wind farms and solar power, to name a few. But while these efforts have paid off on the public-relations front, they are not expected to translate into any real energy savings , at least for the foreseeable future. “**In the short term, there is very little that politicians or anyone can do about the military’s dependence on fuel for transportation**,” says Herman Franssen, an energy consultant and researcher at the Center for Strategic and International Studies. New technologies in synthetic fuels and fuel cells will take decades to produce realistic alternatives that can migrate to military vehicles, airplanes and non-nuclear powered ships. For at least the next 20 to 30 years, says Franssen, “oil will still be the most important fuel.” **Synthetic fuels are mostly a pipe dream**. The only country that makes any significant amount of synthetic fuel is South Africa, whose apartheid government was forced to find an alterative to petroleum in the 1970s during a trade embargo. “The technology exists, but it’s costly and creates environmental problems,” Franssen says. **Biofuels** are promising, but it **will be decades before they can** substantially help to **reduce oil consumption** . Currently, just 4 percent of the gasoline sold in the United States is mixed with corn-derived ethanol

#### Overstretch kills hegemony and U.S. leadership

Haass, 2005 (Richard N, “The Case for "Integration”, The national interest,

[http://www.nationalinterest.org/ME2/dirmod.asp?sid=&nm=&type=Publishing&mod=Publications%3A%3AArticle&mid=1ABA92EFCD 8348688A4EBEB3D69D33EF&tier=4&id=A561B96740654978B3472EFEEB14C84F)](http://www.nationalinterest.org/ME2/dirmod.asp?sid=&nm=&type=Publishing&mod=Publications%3A%3AArticle&mid=1ABA92EFCD8348688A4EBEB3D69D33EF&tier=4&id=A561B96740654978B3472EFEEB14C84F" \t "_blank)

The second question is whether there will be sufficient capacity to carry out a foreign policy premised on integration. Integration requires **U.S. leadership**, which in turn **requires U.S. strength. The United States will need considerable economic and military resources to meet the significant challenges of this era** **and to discourage a renewed great power challenge. The United States enjoys considerable primacy, but how long this primacy will continue is in doubt** given the emergence of enormous fiscal and current account deficits, a strained military that may well be too small, **an energy policy that leaves the United States overly dependent on costly imported oil** and an educational system that over time seems likely to diminish U.S. competitiveness. **Doctrines and foreign policy more generally do not operate in a vacuum; integration or any other American approach to the world will only succeed if carried out by a country that is both able and willing to devote the requisite resources to the many tasks at hand**

### XT Solar Flares

#### 1-in-8 chance that a solar storm large enough to cause a power grid failure will occur by 2020

Huffington Post 12 (Solar Flare Big Enough To Cause Catastrophe On Earth Called Surprisingly Likely, March 1 2012, <http://www.huffingtonpost.com/2012/03/01/solar-flare-big-enough-to-disrupt_n_1313136.html>. Noparstak)

An aurora borealis may be beautiful, but can there be too much of a good thing? **[A new study published in the journal Space Weather](http://www.agu.org/pubs/crossref/2012/2011SW000734.shtml" \t "_hplink) analyzed the frequency of the solar storms** that cause auroras and **found that there's a one in eight chance** that **by 2020** **the Earth will be affected by a major solar flare**. **The risk is far greater than previously thought**. "Even if it’s off by a factor of two, that’s a much larger number than I thought,” study author Pete Riley, senior scientist at Predictive Science, a space "weather" research firm in San Diego, told [Wired](http://www.wired.com/wiredscience/2012/02/massive-solar-flare/" \t "_hplink). Why should a storm on the sun be cause for concern? As it turns out, **the high-energy particles liberated by a major flare might cause "disruption of the transportation, communication, banking and finance systems, and government services; the breakdown of the distribution of potable water owing to pump failure, and the loss of perishable foods and medications because of lack of refrigeration**,” according to a [National Resource Council report](http://www.nap.edu/catalog.php?record_id=12507" \t "_hplink) from 2008. Riley calculated the relationship between the severity of a solar storm and how likely it is to happen, basing his predictions on the so-called Carrington event of 1859, which caused widespread disruption of communication systems as well as brilliant auroras as far south as the Caribbean. During the event, [Scientific American noted](http://www.scientificamerican.com/article.cfm?id=bracing-for-a-solar-superstorm" \t "_hplink), "People could read the newspaper by their crimson and green light. Gold miners in the Rocky Mountains woke up and ate breakfast at 1 a.m., thinking the sun had risen on a cloudy day."

#### New observations prove the current Solar Cycle will produce large solar flares

Wall 12 (Mike, writer for Space.com, Monster sunspot threatens to unleash powerful solar flares, May 8 2012, <http://www.foxnews.com/scitech/2012/05/08/monster-sunspot-threatens-to-unleash-powerful-solar-flares/>. Noparstak

**An enormous sunspot group has taken shape on the surface of the sun, hinting that our star may soon start spouting off some powerful storms**. The huge [sunspot](http://www.space.com/11842-photos-sunspots-sun-solar-cycle-weather.html" \t "_blank)external-link complex, known as AR 1476, rotated into Earth's view over the weekend. It measures more than 60,000 miles (100,000 kilometers) across, researchers said. Scientists with NASA's Solar Dynamics Observatory mission, a space-based telescope watching the sun, **dubbed the solar structure a "monster sunspot**" in a Twitter announcement. AR 1476 is big enough for amateur astronomers with decent equipment to spot from their backyards, weather permitting. (Warning: Never look at the sun directly with telescopes or the unaided eye. Special filters are required for safe solar viewing to avoid serious eye damage.) "With at least four dark cores larger than Earth, AR 1476 sprawls more than 100,000 km from end to end, and makes an easy target for backyard solar telescopes," the website [Spaceweather.com reported](http://spaceweather.com/" \t "_blank)external-link Monday (May 7). **Sunspots are temporary dark patches on the surface of the sun that are caused by intense magnetic activity. These structures sometimes erupt into [solar flares](http://www.space.com/12584-worst-solar-storms-sun-flares-history.html" \t "_blank)**external-link, which send high-energy radiation streaming into space. Solar **physicists classify flares into three main categories: C, M and X, with C being the least powerful and X the strongest**. X-class flares can cause long-lasting radiation storms in Earth's upper atmosphere and trigger radio blackouts. M-class flares can cause brief radio blackouts in the polar regions and occasional minor radiation storms, while C flares have few noticeable consequences. **AR 1476 has already proven quite active, firing off a number of C and M flares over the past few days**, including one Monday evening that seems to be an M1, one of the least powerful M flares, according to Spaceweather.com. **Big solar flares are often associated with coronal mass ejections (CMEs), massive clouds of solar plasma that streak through space at 3 million mph** (5 million kph) or more. **If these clouds hit Earth, they can wreak havoc, spawning geomagnetic storms that can disrupt GPS signals, radio communications and** power grids. CMEs also often super-charge the northern and southern lights, providing dazzling shows for skywatchers at high latitudes. Monday evening's eruption from AR 1476 apparently generated an Earth-directed CME, which should hit Earth sometime Wednesday morning (May 9) Eastern time, researchers said. After remaining surprisingly quiet from 2005 through 2010, **our star began waking up last year, spouting off numerous powerful flares and CMEs**. Most experts expect such outbursts to continue over the next year or so. **Solar activity waxes and wanes on an 11-year cycle, and scientists think the current one — known as Solar Cycle 24 — will peak in 2013.**

### XT Terror

#### Evidence proves that terrorists are attempting to take down the grid—even simple hacking could cause a chain reaction of nuclear meltdowns

GEI 10 (Galving Electricity Initiative, founded by CEO Robert Galvin, pushing for electric grid reform for a secure, sustainable, energy future, "The Electric Power System Is Insecure", http://galvinpower.org/resources/library/fact-sheets-faqs/electric-power-system-insecure

**There is evidence that terrorist organizations are considering an attack on the power grid**. In the summer of 2001, the coordinator for the city of Mountain View, Calif.’s Web site noticed a suspicious pattern of intrusions. **The FBI investigated and found** similar **“multiple casings of sites” in other cities throughout the United States. The probes seemed to originate in the Middle East and South Asia, and the visitors were looking up information about the cities’ utilities, government offices and emergency systems.** This information took on new significance when **U.S. intelligence officials examined computers seized from al-Qaida operatives** afterthe Sept. 11 attacks **and discovered what appeared to be a broad pattern of surveillance of U.S. infrastructure**. Yet **the electric power system appears to be extremely vulnerable to even relatively unsophisticated cyberattacks**. In 1997, as part of a previously classified Department of Defense exercise — code name “Eligible Receiver” — a team of **hackers from the** National Security Agency (**NSA**) was organized to infiltrate the Pentagon systems. **Using only publicly available computer equipment and hacking software**, the team **was able to** infiltrate and **take control of the computers serving the U.S. Pacific Command center, as well as power grids and 911 systems in nine major U.S. cities**. More than 50 percent of the electric utility personnel who responded to a survey by the Electric Power Research Institute believe that an intruder in the information and control systems at an electric utility could cause serious impact on, or beyond, the region for more than 24 hours. Open sources — including Federal Energy Regulatory Commission (FERC) filings, electric industry publications, regional maps and the Internet — could provide enough information to identify the most heavily loaded transmission lines and most critical substations in the power grid. Relatively simple hacking techniques could then be used to locate dial-in ports to these points and modify settings to trigger an outage. Only a detailed review of logs or the elimination of all other factors would lead to the detection of such an attack. **In the event of a simultaneous accident in which a nuclear power station is shut down at the same time the main power lines fail, the emergency siren system for the entire emergency planning zone will lose power and be unable to alert the surrounding population**. In response to a petition filed by Nuclear Information and Resource Service (NIRS) and 16 other organizations and local governments, the U.S. Nuclear Regulatory Commission (NRC) revealed that **28 reactor emergency planning zone siren systems are entirely reliant upon electricity from their regional grids. Another 18 sites have only partial emergency power backup available to siren systems.** Only 17 reactor sites have siren systems that are fully backed up with emergency power systems that would allow them to remain operational independent of the failure of main power lines.

#### Statistical risk analysis proves that the United States must act to protect against the increasing risk to our power grid

Simonoff et al 4 (Jeffrey, professor of statistics at New York University, Carlos Restrepo, Rae Zimmerman, New York University professors, "Risk Management and Risk Analysis-Based Decision Tools for Attacks on Electric Power, October 1 2004, <http://research.create.usc.edu/cgi/viewcontent.cgi?article=1158&context=nonpublished_reports&sei-redir=1&referer=http%3A%2F%2Fwww.google.com%2Furl%3Fsa%3Dt%26rct%3Dj%26q%3Dterrorist%2520attempt%2520power%2520grid%2520attack%2520potential%26source%3Dweb%26cd%3D4%26ved%3D0CFkQFjAD%26url%3Dhttp%253A%252F%252Fresearch.create.usc.edu%252Fcgi%252Fviewcontent.cgi%253Farticle%253D1158%2526context%253Dnonpublished_reports%26ei%3DJ7j5T-auLcGZqAHT7_mLCQ%26usg%3DAFQjCNG2O8M2NnxCfW2bmwDn0PV2NIoLAA#search=%22terrorist%20attempt%20power%20grid%20attack%20potential%22>. Noparstak)

A critical need exists to develop the means to provide decision tools to estimate the consequences of terrorist attacks against electric power systems as part of the growing field of risk analysis for terrorism events. This is particularly difficult in the U.S. given the very few terrorist attacks that have disabled electric power systems, and none that have actually directly targeted electric power. This paper has provided a framework for analyzing available electric outage data to gain a better understanding of the factors that influence outcomes such as the number of customers lost and duration of an outage. **The statistical models used reinforce the importance of probabilistic assessment of risk, whether that is estimating the probability of zero customer loss, or constructing prediction intervals within which outage characteristics such as duration and customer loss are predicted to fall with specified probability**. Clearly, **such risk assessment also leads directly to issues of risk management, such as in questions of resource allocation**. The analyses were done for the U.S. and Canada and the results show how the model can be used to identify important differences for the two countries. These patterns, besides being of interest in and of themselves, highlight the need for general statistical models for probabilistic risk assessment, since it is apparent that the consequences of outages differ for incidents in different places, at different times, and with different underlying characteristics. DRAFT 29 First, at **the level of overall trends in events over time, the number of disturbances to the electric grid increased over the period studied** for both countries. **In the U.S. the annual rate of increase was estimated to be 7.2%** and in Canada it was 8.2%. However, while the number of events with non-zero megawatt loss increased in the U.S. at an annual rate of 10%, in Canada there was no evidence of a time trend for these events. Similarly, the number of events with non-zero customer loss increased in the U.S. at an estimated annual rate of 14% but in Canada the model provided little evidence of any relationship with season or time for these events. Second, the results of the event level analyses can provide insights into the dynamics underlying the factors affecting disturbances in each country. The results show that the dynamic is different in the two countries. For example, in estimating the number of customers lost during an outage the model predicts that in the U.S. there is a weak but direct relationship with total number of customers served by a utility. In Canada the model suggests an inverse relationship. In the U.S. model there is no relationship between customer loss and season whereas in the Canada model customer loss is lower in the spring and summer. In modeling the duration of an event, the results suggest that in the U.S. outage duration was decreasing in the early 1990s and then started to increase in the mid-1990s. This is due to the fact that the relative frequency of the cause of the events changed over time, with weather related events becoming more common over time during this period and equipment related disturbances less so. Weather related events are associated with longer durations. The Canada data, on the other hand, show little evidence of any relationships. Third, the results of these models can provide information about outcomes such as expected customer loss and duration of outages in different seasons and for cities with different characteristics, and hence inform response to outages in both terror-related and non-terror-related circumstances. The results of the 50% prediction intervals shown in this paper for **cities with characteristics like those of New York City** and Toronto are very different. For example, **in terms of outage duration** the results for New York City suggest that the longest durations **are to be expected from weather events, unknown causes and third parties**. In Toronto the highest expected durations are from crime-related events. In terms of customer loss, **the results for New York City suggest crime and natural disasters could have the biggest impact**. In Toronto system protection, equipment failure, human error and crime have the highest impact.

### Power Grid Cards

#### Back-ups to the electric grid can be hacked with a cell phone

Saporito 11 (Thomas, consultant for Saprodani Associates, a consulting group of professionals engaged in financial planning, stocks, bonds, currencies, realtor services, environmental consulting, renewable energy consulting, "U.S. Electric Grid Subject to Imminent Terrorist Attack", Aug 13 2011, <http://www.prlog.org/11623419-us-electric-grid-subject-to-imminent-terrorist-attack.html>. Noparstak)

[PRLog (Press Release)](http://www.prlog.org) - Aug 13, 2011 - **The electric grid** spanning the continental United States **is extremely vulnerable to a terrorist attack.** According to James Woolsey the former Central Intelligence Director (CIA), **there is no U.S. Government agency charged with the security and protection of the U.S. electric grid.** Moreover, **the U.S. is currently constructing a "so-called" smart grid** where utility companies like the Florida Power & Light Company (FPL) are installing "smart meters" that allow the meter to remotely control power taken from the electric grid. According to Woolsey, this is really a "stupid-grid" **where terrorists can gain access remotely using a cell phone and take down the grid**. **The on-going nuclear disaster in Japan where three nuclear-reactors continue to melt-down was caused by the failure of the electric grid** in Japan which resulted in a station "black-out" at the Fukushima nuclear plants.

#### Evidence proves that terrorists are attempting to infiltrate the power grid—even simple hacking could cause a chain reaction of nuclear meltdowns

GEI 10 (Galving Electricity Initiative, founded by CEO Robert Galvin, pushing for electric grid reform for a secure, sustainable, energy future, "The Electric Power System Is Insecure", http://galvinpower.org/resources/library/fact-sheets-faqs/electric-power-system-insecure

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#### Heg I-Link—power grid failure collapses military forces

Snider 12 (Annie, E&E reporter, "Pentagon still can't define 'energy security', much less achieve it", Jan 16 2012, http://www.eenews.net/public/Greenwire/2012/01/16/1

Hurricane **Katrina humbled U.S. military bases** in 2005, cutting power at air towers, training facilities and command centers just as it did everywhere else along the Gulf Coast. **The Naval Construction Battalion** Center in Gulfport, Miss., for example, a staging ground for regional relief operations after the storm, **needed relief** itself **after running for two weeks on backup power systems**. And **Keesler Air Force Base** near Biloxi, Miss., **lost its airfield lights and had to scramble to keep its hospital running after a generator was swamped**. While diesel generators kept critical missions going during Katrina, the storm **provided a wakeup call for Pentagon leaders concerned about terror attacks on the electric grid, which provides 99 percent of the energy that bases consume**. Could bases withstand a power outage that outlasts their three-to-seven-days' supply of diesel for backup systems? Is it wise for the military to rely on the same power plants and transmission lines that feed homes and businesses? **A terrorist attack that caused a long-term grid disruption "could significantly affect our military forces globally -- potentially blinding them, neutering their command and control, degrading their mobility and isolating them from their principal sources of logistics support,**" Paul Stockton, the Pentagon's assistant secretary for homeland defense, [wrote](http://www.hsaj.org/?fullarticle=7.2.11) recently in the online journal Homeland Security Affairs. A board of outside experts tasked by the Department of Defense to study the issue found in a 2008 [report](http://www.acq.osd.mil/dsb/reports/ADA477619.pdf) that there are significant gaps in DOD's ability to prevent and respond to major electrical outages. "**Critical national security and homeland defense missions are at an unacceptably high risk of extended outages from failure of the grid**," the Defense Science Board concluded. "The grid is fragile, vulnerable, near its capacity limit, and outside of DOD control. In most cases, **neither the grid nor on-base backup power provides sufficient reliability to ensure continuity of critical national priority functions and oversight of strategic missions in the face of long-term** (several months) **outage**." And while the Pentagon has joined interagency efforts to beef up grid security, experts say solutions remain elusive. Four years after the Defense Science Board report, DOD has yet to define what "energy security" means at its bases, let alone how to assure it, according to dozens of interviews with military officials, lawmakers, defense energy experts, project developers and utilities. How DOD ultimately answers these questions will not only determine the limits of U.S. defenses; it is also likely to send waves through civilian energy and technology industries.

### AT NRC CP

#### The last time the NRC tried to fix the power grid, it failed

Saporito 11 (Thomas, consultant for Saprodani Associates, a consulting group of professionals engaged in financial planning, stocks, bonds, currencies, realtor services, environmental consulting, renewable energy consulting, "U.S. Electric Grid Subject to Imminent Terrorist Attack", Aug 13 2011, <http://www.prlog.org/11623419-us-electric-grid-subject-to-imminent-terrorist-attack.html>. Noparstak)

In the aftermath of that on-going crisis, **the** U.S. Nuclear Regulatory Commission (**NRC**) **formed a special task force to gain insight about how to better safeguard U.S. nuclear power plants from a melt-down** event due to a station blackout **where off-site power is lost from the electric grid**. Although the NRC task force recommended increasing the backup power generation and station battery capability at all U.S. nuclear power plants, **the NRC task force failed to** adequately **address the** imminent **threat of a cyber attack** on the U.S. electric grid which could take down significant sections of the U.S electric grid for a significant period of time **causing multiple nuclear reactors to simultaneously melt-down around the USA.** Such an attack would essentially render the U.S. defenseless and result in serious harm to the economy which could take decades to recover**. The radioactive contamination spewed from multiple nuclear reactors would devastate the U.S. food chain and water table for years into the future. Generations of children would ultimately suffer serious cancer-related illnesses for decades.**

### AT: Plan Causes Emissions

#### No Turns—Solar Road Panels have a small carbon footprint in creation and can be transported using self-producing energy

Brusaw 12 (Scott, an electrical engineer with over 20 years of industry experience, including Director of Research and Development at a manufacturing facility in Ohio, and a voting member of NEMA, “Solar Roadways: A Real Solution”, http://www.solarroadways.com/transport.shtml. Noparstak)

**Using** the **hydroelectric** power in our area, **we can make our Solar Road Panels with very little carbon footprint**. But how do we now transport these panels to where they're needed using as little fuel as possible? **The Solar Road Panels are large and heavy, but they do produce power when exposed to the sun**. One railroad company visited our electronics lab and saw the Solar Road Panel prototype. We discussed methods of transporting it by rail (we intend to build our manufacturing facilities with rail access). Diesel-electric locomotives are the standard today: they have diesel engines to turn generators, which produce electricity to actually propel the train. In essence, it's an electric train that generates its own electricity with diesel fuel. But what if the cargo could produce the electricity instead? **We are considering the possibility of making rail cars that would allow us to stack our Solar Road Panels in such a way that they were exposed to the sun: facing outward on both sides and upward on top of the rail cars. No matter which direction the train was traveling, its cargo would be producing electricity**. For the first time since the age-old coal car, **a train could have cars that fuel the locomotive and offset** (or create entirely?) **the energy used to get the cargo to its intended location.**

### XT: Autos Key

#### U.S. automobiles key to CO2 emissions

DeCicco and Fung 6 (John, Ph.D. Mechanical Engineering, Princeton University, Freda, senior policy analyst for ICCT, former automotive analyst at Environmental Defense Fund, "Global Warming on the Road: The Climate Impact Of America's Automobiles", 2006 <http://www.edf.org/sites/default/files/5301_Globalwarmingontheroad_0.pdf>. Noparstak)

The global warming pollution from all **U.S.** cars and light trucks amounted to 314 MMTc in 2004. This **“rolling carbon” accounts for about one-half of CO2 emissions from all passenger vehicles around the world and about 6% of global energy-related CO2 emissions**. The amount of CO2 emitted a year from the U.S. vehicle stock is equivalent to the amount of carbon in a coal train 50,000 miles long. At the national level, data on the history of vehicle sales and statistics on vehicle usage enable us to breakdown the total rolling carbon by automaker and type of vehicle. Such an analysis shows, for example, that the CO2 emissions from each of GM’s, Ford’s and DaimlerChrysler’s vehicles exceed those from any electric power company. However one looks at the issue, **the car’s contribution to global warming pollution is enormous.** Rolling carbon can be analyzed in terms of the factors—VMT, fuel economy and fuel carbon content-that determine emissions. For developing new policies, however, it is instructive to consider the actors whose decisions influence each factor. Auto companies are, of course, a key actor through their product strategies and product design decisions. But other parties, including individuals and businesses that purchase and use vehicles, energy companies that provide auto fuel, and various levels of government that influence land-use and transportation decisions, all play a part in influencing the total rolling carbon. The total CO2 emissions from all vehicles on the road are in fact the result of complex and interdependent decisions made by many actors. Policy discussions on curbing automotive carbon emissions have tended to center on the technical factors that characterize the sector’s emissions. However, changing these factors to reduce auto carbon emissions will require complementary decisions by multiple actors who influence emissions. **Our rolling stock tally underscores the magnitude of automotive CO2 emissions, highlighting the potential roles of the many actors in the system**. It also suggests a need for new tools to help each actor understand how their decisions impact emissions, paving the way for new policies that can foster carbon-sensitive decisions making. Such a carbon management paradigm would serve to make carbon emissions reduction an objective in day-to-day decision making, so that each actor in sector can seek opportunities for reducing those aspects of total emissions that each can best influence.

### AT: Doesn’t Account for Clouds

#### Our studies account for a ride range of chemicals as well as the impact on clouds

NASA 10 (National Aeronautics and Space Administration, "Road Transportation Emerges as Key driver of Warming", Feb 18 2010, <http://www.giss.nasa.gov/research/news/20100218a/>. Noparstak)

For each sector of the economy, **Unger's team analyzed the effects of a wide range of chemical species, including carbon dioxide, nitrous oxide, methane, organic carbon, black carbon, nitrate, sulfate, and ozone**. **The team also considered how emissions from each part of the economy can impact clouds, which have an indirect effect on climate**, explained Surabi Menon, a coauthor of the paper and scientist at the Lawrence Berkeley National Laboratory in Berkeley, Calif. Some aerosols, particularly sulfates and organic carbon, can make clouds brighter and cause them to last longer, producing a cooling effect. At the same time, one type of aerosol called black carbon, or soot, actually absorbs incoming solar radiation, heats the atmosphere, and drives the evaporation of low-level clouds. This process, called the semi-direct aerosol effect, has a warming impact. The new analysis shows that emissions from the power, biomass burning, and industrial sectors of the economy promote aerosol-cloud interactions that exert a powerful cooling effect, while on-road transportation and household biofuels exacerbate cloud-related warming. More research on the effects of aerosols is still needed, Unger cautions. "Although our estimates of the aerosol forcing are consistent with those listed by the International Panel on Climate Change, a significant amount of uncertainty remains."

### Highway Generic Inherency

#### Federal Highways Facing Funding Cuts Now

Governing.com 2011 (June 2011, Six Ideas for Fixing the Nation's Infrastructure Problems, “http://www.governing.com/topics/transportation-infrastructure/six-ideas-for-fixing-the-nations-infrastructure-problems.html”, Accessed 7/3/12, KW)

By most accounts, transportation infrastructure in the United States is in serious disrepair. As roads and bridges across the country continue to age and deteriorate, governments at all levels are struggling to pay for maintenance and upkeep -- not to mention investments in much-needed upgrades and new projects. Since the federal Highway Trust Fund was established in the late 1950s, total combined highway and transit spending as a share of gross domestic product has fallen by about 25 percent, according to the federal National Surface Transportation Infrastructure Financing Commission. Without changes to current policy, the commission projects a federal highway and transit funding gap totaling nearly $2.3 trillion through 2035.

#### Cars are expected to quintuple by 2050- study proves

Birkey et al 1(“Future US Highway Use: A Fifty Year Perspective”,

www1. eere.energy.gov, p.11, Accessed 7/6/12, KW)

Vehicle Population: The motorization of the world has been a major development over the last fifty years. The U.S. accounted for an astonishing 70% of the world’s light vehicles in 1950, but only 30% by 1998 after the world's total number of light vehicles increased ten-fold to 700 million. A simple model of world vehicle ownership as a function of income (GDP), combined with population projections from the World Bank, was employed to explore future world transportation energy demand. As shown in Figure 6, this analysis projects that the total number of light vehicles is likely to increase by a factor of 3 to 5 over the next fifty years, resulting in two to three and a half billion worldwide. Other analyses have yielded similar results, notably Gately (3.1 billion in 2050) and the World Business Council for Sustainable Development (1.25 billion in 2025).19,20 In addition to impacts on world energy use, this dramatic increase in vehicles would require phenomenal growth in manufacturing, which has significant implications for materials use and capital infrastructure, particularly after 2040.

#### Rural Highways key to economy- agriculture and trade patterns prove

Governing.com 2011 (June 2011, Six Ideas for Fixing the Nation's Infrastructure Problems, “http://www.governing.com/topics/transportation-infrastructure/six-ideas-for-fixing-the-nations-infrastructure-problems.html”, Accessed 7/3/12 KW)

Highways in rural states play a critical role in the country’s economy: They connect to Western ports to facilitate the transport of goods, and they serve as interstate bridges for agriculture, energy and freight industries. But with national transportation planning often focused on urban development, rural highways can get neglected, leading to stretched capacity, reduced connectivity and strained two-lane roads used by heavy trucks. Mass transit in rural areas is even more problematic. In 2010, 8.9 million rural residents lacked access to intercity transportation by air, bus, ferry or rail, up from 5.4 million in 2005, according to a report from the Department of Transportation’s Bureau of Transportation Statistics. Alabama had the steepest drop: Nearly 700,000 rural residents lost access between 2005 and 2010. As Congress debates reauthorization of transportation funding, rural states will be working to remind lawmakers of their unique needs, says John Cox, director of the Wyoming Department of Transportation, who recently testified before the Senate Committee on Environment and Public Works on behalf of Wyoming, Idaho, Montana, North Dakota and South Dakota. “In the mix of competing issues for putting together a transportation bill, our priority is to make sure that the rural states are part of that deliberation,” he says, “and that the next highway bill doesn’t become too preoccupied with the legitimate needs of cities to the exclusion of [rural communities].”But rural states shouldn’t just wait idly for federal funds to trickle down, says Sean Slone, transportation policy analyst for the Council of State Governments. Transportation officials, he says, should use their limited dollars to widen and upgrade two-lane roads and relieve congestion by investing in roadway redesign and technologies that improve traffic flow. “By improving roads in, around and through rural communities, states and localities can better serve the freight, agricultural and energy sectors and make them an even more vital link in the nation’s supply chain,” he says. “That will, in turn, put rural states higher on the priority list for future federal investment.”

#### The transportation industry is key to jobs and the economy

Birkey et al 1(“Future US Highway Use: A Fifty Year Perspective”,

www1. eere.energy.gov, p.7, Accessed 7/6/12, KW)

Currently, the U.S. transportation system generates more than 2.5 trillion vehicle miles of travel and 4 trillion ton-miles of freight movements annually. The transportation sector accounts for 11 percent of Gross Domestic Product (GDP), as measured by transportation-related final demand. Each year, consumers spend around $600 billion on transportation -- $120 billion on gasoline alone. One out of nine U.S. workers is employed in transportation and related industries. Yet even these statistics do not convey the critical importance of transportation to the U.S. economy and way of life. Ours is a mobile society, and transportation touches nearly every aspect of our daily lives.

#### Transportation is the largest contributor to emissions and ozone

Birkey et al 1(“Future US Highway Use: A Fifty Year Perspective”,

www1. eere.energy.gov, p.10 , Accessed 7/6/12, KW)

Criteria Pollutants: Over the past four decades, the combination of steadily more demanding emissions regulations, improved fuels, and continued advances in pollution control technology have enabled significant strides in reducing total air emissions and improving air quality. However, at the end of 1999, over 100 million people in the U.S. -- nearly 40% of the country's population -- still lived in non-attainment areas. Most of these people live in 32 areas that do not meet the Environmental Protection Agency’s National Ambient Air Quality Standards for ozone, a prime ingredient of smog and a major urban area problem in the summer. Ozone is formed by a photochemical reaction of nitrogen oxides and reactive hydrocarbons (organic) vapors in the presence of sunlight. Transportation accounts for 50% of nitrogen oxides and 40% of volatile organics. Transportation is also responsible for nearly 80% of the nation’s carbon monoxide emissions. In California air basins, the ‘worst case’ is the South Coast Air Quality Management District. It is projected that this district will meet the Federal Ambient Air Quality Standards by the year 2010 and will be maintained through the year 2020. Continued growth in population and transportation could require new limitations on automotive emissions in order to remain in compliance through 2050. The California Air Resources Board has encouraged the development of zero emission vehicles as a means of combating the region's chronic air pollution problem. In other areas of the United States, including the Northeast States and Texas, ozone and other air quality problems are more complex. Current understanding of these problems is incomplete, and what emissions control measures are needed for long-term attainment and maintenance of the Federal Ambient Air Quality Standards are uncertain. Concern over air toxics from mobile sources, including benzene, formaldehyde, and 1-3 butadiene, also will affect choice of technologies for future vehicles. Better understanding of the health effects of nanometer-sized particles produced by internal-combustion engines may well lead to continued tightening of emission controls, further increasing the cost of vehicles and conventional fuels to meet stricter standards. Since some of the vehicle and fuel technologies that could reduce oil dependence could either improve or exacerbate air quality problems, emissions should be a major consideration in planning for the future.

#### More ev- US transportation is the largest contributor to emissions- increasing now

Birkey et al 1(“Future US Highway Use: A Fifty Year Perspective”,

www1. eere.energy.gov, p.11, Accessed 7/6/12, KW)

On a greenhouse warming potential basis, U.S. emissions of CO2 constitute more than 80% of the nation's total greenhouse gas emissions. While comprising only about 5% of global population, the US is responsible for nearly one fourth of global annual CO2 emissions. Transportation accounts for a third of all carbon dioxide emissions in the country, and about one fourth worldwide. U.S. passenger cars and light trucks account for nearly two thirds of the net carbon equivalent emissions from transportation, or 16% of total U.S. greenhouse gas emissions.28 As shown in Figure 10, the EIA projects that, between 1997 and 2020, CO2 emissions from transportation fuel use will grow faster than any other sector at 1.7% annually, increasing by 50% over the period.

#### Competition- China catching up now

Cox 2011(Wendell Cox is principal of Demographia, an international public policy firm located in the St. Louis metropolitan area. He has served as a visiting professor at the Conservatoire National des Arts et Metiers in Paris since 2002. His principal interests are economics, poverty alleviation, demographics, urban policy and transport. He is co-author of the annual Demographia International Housing Affordability Survey.

Mayor Tom Bradley appointed him to three terms on the Los Angeles County Transportation Commission (1977-1985) and Speaker of the House Newt Gingrich appointed him to the Amtrak Reform Council, to complete the unexpired term of New Jersey Governor Christine Todd Whitman (1999-2002). He is author of [War on the Dream: How Anti-Sprawl Policy Threatens the Quality of Life](http://www.amazon.com/gp/product/0595399487?ie=UTF8&tag=newgeogrcom-20&linkCode=as2&camp=1789&creative=390957&creativeASIN=0595399487), 1/22/11, CHINA EXPRESSWAY SYSTEM TO EXCEED US INTERSTATES, “http://www.newgeography.com/content/002003-china-expressway-system-exceed-us-interstates”, Accessed 7/3/12, KW)

By 2020, China expects to have 53,000 miles (85,000 kilometers) of expressways. This compares to the US total of approximately 57,000 miles (92,000 kilometers), including non-interstate freeways. However, the China expressway mileage does not include the expressways administered by provincial level governments, such as in Beijing (with its five expressway ring roads), the extensive system of Shanghai and the expressways of Hong Kong. No data is readily available for the lengths of these roads.

### Potential Add-Ons

#### Solar Roadways prevents roadkill

Brusaw 12 (Scott, an electrical engineer with over 20 years of industry experience, including Director of Research and Development at a manufacturing facility in Ohio, and a voting member of NEMA, “Solar Roadways: A Real Solution”, http://www.solarroadways.com/wildlife.shtml. Noparstak)

Every year, our nation's motorists kill nearly 400 million road animals. For every dead animal counted, three or four more die unnoticed: the walking wounded die far from the road, so only instantly killed animals get counted. Studies by the Humane Society have shown an automotive kill rate of a million animals per day in the US alone. These figures include mammals, birds, reptiles, and amphibians. Load cells in the Solar Road Panels can detect if something is on the surface of the panel. Load cells work like weight machines. In the event that an animal does get onto the Solar Roadway™, oncoming drivers will be warned via embedded LEDs of the danger ahead and will be given plenty of time to slow down. This allows the avoidance of a potentially costly and/or deadly collision. Currently, about 200 people die in wildlife related crashes each year. Not only will Solar Roadways save lives, but hopefully our auto insurance rates will go down as a result. Motion sensors can detect animals approaching the roadway and steer them away from non-migratory areas. While we are redoing the roadways, it will be a good opportunity to create some natural places to allow animals to travel under or over the roadways, where natural migratory paths exist.

#### Solar Roadways create a butt-load of jobs

Brusaw 12 (Scott, an electrical engineer with over 20 years of industry experience, including Director of Research and Development at a manufacturing facility in Ohio, and a voting member of NEMA, “Solar Roadways: A Real Solution”, http://www.solarroadways.com/economy.shtml. Noparstak)

**It will take** roughly **five billion** 12' by 12' **Solar Road Panels**™ **just to cover the roads**, parking lots, and driveways in the United States. Imagine the manufacturing requirements: **it will create so many new jobs that it may very well become the "New Deal" of the 21st century**. **We can retrain workers from obsolete jobs such as coal miners and asphalt workers with new "Green Collar" jobs**. **Unemployment rates will plummet. Vast sums of money will be injected back into our economy. This could create the biggest mobilization this country has seen since WWII**. Each Solar Road Panel™ measures 12 feet (about 4 meters) by 12 feet. Each panel contains solar collectors, circuit boards, electronics parts, etc. All of these have to be assembled. Let's say it take a minimum of 10 hours to completely assemble one Solar Road Panel™. Ten hours is probably a conservative estimate, but it's a nice round number. Five billion panels requiring 10 hours to assemble means 50 billion assembly hours. Let's give ourselves ten years to accomplish this monumental task, leaving us 5 billion assembly hours per year. A typical U.S. worker spends 40 hours per week at work. Let's give our worker two weeks vacation and say he never misses a day of work otherwise. That's 50 weeks at 40 hours per week comes to 2000 work hours per year. Divide that into five billion assembly hours and **you'd put 2,500,000 people to work full-time for ten years**. This is just the final assembly! **We haven't yet taken into account the increased jobs at the suppliers end.** For instance, the glass maker has to create five billion sheets of special textured glass for the top layer. Someone has to create all of the circuit boards and what about all of increased jobs at the parts manufacturers? Each Solar Road Panel™ contains 6192 LEDs alone. Who will make all of these parts? Then **we must take into account installation, maintenance, system monitoring, panel refurbishing, distribution**, etc. **Every aspect of our economy could flourish**.

#### Solar Roadways solve marine litter

Brusaw 12 (Scott, an electrical engineer with over 20 years of industry experience, including Director of Research and Development at a manufacturing facility in Ohio, and a voting member of NEMA, “Solar Roadways: A Real Solution”, <http://www.solarroadways.com/materials.shtml>. Noparstak)

**Recycled materials can be used for the internal support structure. Over 46,000 pieces of plastic litter are floating on every square mile of ocean today**. In the Central Pacific, **there are up to 6 pounds of marine litter to every pound of plankton**. Trash bags, water bottles and other plastics, and rubber tires can be mixed with organic materials to create parts of the Solar Road Panels: five billion of them for the U.S. alone! Incorporating this waste into the internal support structure of the Solar Road Panel will be a focus of our Phase II research. What better way to "kill two birds with one stone" than to give the garbage that sits in our landfills and oceans a new home inside the very panels that can power our world? We want to make every effort to keep the project "green", following the adage for reduce, reuse and recyle. This will be true from manufacturing all the way through to installation and maintainance.