# Solar Sails CP

## **1NC—Solar Economy Plank**

### **The United States federal government should:**

### make 10 billion dollars available to the Federal Energy Management Program to invest in the construction and operation of 4.000 MW of solar on federal buildings and lands; and

### create tax incentives for manufacturing solar energy.

The CP allows for a transition to a solar economy—it’s the most efficient energy and solves their impacts.

SEIA 8 (The Solar Energy Industries Association “Solar Energy Fuels Domestic Job Growth: A Blueprint for Job Creation and Economic Security” <http://www.geni.org/globalenergy/library/technical-articles/generation/call-for-action/seia/solar-energy-fuels-domestic-job-growth/SEIA%20Policy%20Priorities%2012.3.08.pdf> //Donnie)

The current economic crisis requires the United States government to make strategic investments in industries that will improve our economy. At the same time, our nation has an opportunity to invest in industries that foster our energy independence, improve our security and reduce our greatest environmental risk – global warming. Increasing the use of solar energy will provide a clean, reliable and domestic source of energy while creating millions of new jobs. Solar is not only the cleanest technology, but solar produces more jobs per megawatt (MW) of installed capacity than any other source of energy. From electricians and roofers to manufacturing line workers and sales agents, an expanded solar energy sector will greatly benefit the U.S. economy with new jobs. However, the growth of solar energy will not happen quickly enough without the right federal policies to stimulate the market and remove fundamental barriers that prevent solar from competing in the electricity marketplace. We call on President‐elect Obama and the Leadership of the 111 th Congress, to make solar energy a fundamental part of our economic and energy policy. This includes establishing the goal of 12.5 percent of electricity generation to come from solar by 2020 and the creation of at least 1.5 million new jobs in the solar industry. To achieve this vision, President‐elect Obama and Congress must create programs that rapidly deploy solar energy, remove market barriers, and educate the public on the benefits of solar energy. The Solar Energy Industries Association recommends that the new administration and Congress enact and fund the following policies and programs to expand the creation of clean energy jobs in the United States. If the four immediate priorities are enacted by the end of the first quarter of 2009, the cumulative impact will create more than 1 million jobs by 2011. Immediate Priorities As part of an economic stimulus bill, Congress should include the following provisions: 1. Improve Solar Tax Credits The current downturn in the economy has substantially reduced the utility of the solar investment tax credits (ITC) extended by Congress on October 3. To address this challenge, the credits should be improved to (1) be refundable (including accelerated depreciation) for 8 years or make them fully transferable; (2) extend the credit carry‐back period; (3) adjust the credit from 30 percent to 50 percent for residential and small scale commercial; (4) allow master limited partnerships (MLPs) to fully utilize the credits; (5) modify the residential ITC to allow for the eligibility of solar space heating and cooling systems with no monetary cap; (6) allow state and local governments to provide financing without reducing ITC eligibility; and (7) allow for active passive loss provision. Creates 165,000 jobs. 2. Increase Government Procurement The Federal government is the largest utility customer in the U.S., spending $5.8 billion annually on electricity. A massive investment in all types of solar energy technologies to power the federal government (including military operations) will lower electricity bills, reduce carbon emissions, and develop energy security for the country’s most important missions. Accordingly, the federal government should make $10 billion available immediately to the Federal Energy Management Program to invest in the construction and operation of 4,000 MW of solar on federal buildings and lands. Federal agencies should be authorized to enter into 25‐ year power purchase agreements (PPAs) and appropriations should be made to immediately implement the 30 percent solar thermal requirement on federal buildings. Creates 350,000 jobs. 3. Create Tax Incentives for Manufacturing Solar energy manufacturing is expanding worldwide, but the U.S. is at a significant disadvantage to countries like China and Germany that offer strong incentives to locate new manufacturing facilities. This program would level the playing field by offering accelerated depreciation and a 30 percent refundable tax credit for the purchase of manufacturing equipment used to produce solar material and components for all solar technologies (e.g., silicon, solar cells, evacuated tubes, and flat‐plate solar collectors). Creates 315,000 jobs.

## **Solar Sails Solve—Asteroids**

### Solar sails change asteroid trajectory-keeps them from hitting earth

**Hsu 10** (Jeremy, is a staff writer, “Solar Sail Flotilla Could Divert” http://www.space.com/10531-solar-sail-flotilla-divert-possibly-dangerous-asteroid.html /Donnie)

A flotilla of solar sail spacecraft could change the course of the asteroid Apophis — which is headed a little too close to Earth for comfort — by shading the space rock from solar radiation, according to a French researcher. Such a plan could help shift Apophis into a slightly safer orbit by the time it is expected to swing by Earth on April 13, 2036. But experts have warned previously that any efforts to divert the space rock could actually make matters worse. The preliminary concept idea was proposed at a symposium on solar sails ? which are spacecraft powered by sunlight pushing against a sail ? a few months ago at the New York City College of Technology in Brooklyn. "Apophis is a nice target for launching this kind of mission for 20 years from now; not too far, not too close," said Jean-Yves Prado, an engineer at the National Center for Space Study (CNES) in France. How to move a space rock A group of formation-flying solar sails could alter the asteroid's course by eliminating the so-called Yarkovsky effect, a phenomenon described by Russian engineer I.O. Yarkovsky a century ago. That effect occurs when the sun warms an asteroid more on the sun-facing side than the far side. The rock then emits more thermal radiation on its near side, which creates a bit of thrust and changes its momentum slightly

## Solar Sails Solve—Asteroid Hopping

### **Solar propulsion allows us to study asteroids**

Morrow and Scheeres 1 (Esther Morrow Research Associate, California Space Institute, Scripps Institute of Oceanograpy AND D. J. Scheeres Assistant Professor, Department of Aerospace Engineering

Relying on solar propulsion instead of convential propulsion allows us  exibility in studying asteroids. With a solar sail spacecraft, we are not limited by carrying onboard supplies of fuel for propulsion. Depending on sail performance in the space environment, several asteroids could be visited in succession and orbited for extended periods of time. Thus, a spacecraft of this type could enhance our understanding of asteroids by shortening the period of time between missions. We derive a model for solar sail dynamics about an asteroid and consider a number of possible options for operations in the asteroid environment. We  nd limits on feasible sail operations as a function of sail parameters, asteroid parameters, and asteroid orbit. Both orbital and hovering options are considered. For the purposes of this study, we focus only on the behavior of the solar sail spacecraft after rendezvous has been achieved.

## **Solar Sails Solve—Colonization**

### **Solar sail tech exists now—its key to sustainable colonization**

Gilster 7 (Paul, investigates the science, and the spirit, of the NASA and JPL researchers “Interstellar Sails and Their Precursors” <http://www.centauri-dreams.org/?p=1597> //Donnie)

Solar sail technology is no idle dream. After extensive study at Marshall Space Flight Center, NASA’s basic sail design has reached the point where space testing is the logical next step even as research continues in European venues like Germany’s DLR. When we begin a serious push into solar sail technologies, we’ll need to test these designs in near-Earth orbit, and then move out into the Solar System. A logical mission for early sails will be, as Friedman notes, a replacement for the Advanced Composition Explorer (ACE), a mission nearing the end of its lifetime. ACE operates at a libration point where the gravitational forces of Sun and Earth balance, some 1.5 million kilometers from Earth. A sail mission that could monitor solar weather (and warn us of solar storms) could offer a new kind of station-keeping, one that uses the momentum imparted by photons to stay in position closer to the Sun without the need of remaining at the libration point. Such a position would, among other things, allow greater early warning of potential ionospheric disruptions. The range of sail missions available in coming decades will be huge, but if we keep at it, we may get to the point where building the kind of laser we’ll need for an interstellar mission becomes possible. Solar sailing is the kind of next-step technology that moves us from one-shot mission spectaculars like Apollo into the realm of a stable and long-term human presence expanding into the Solar System. For the short term, we need to keep doing what Friedman and sail advocate Gregory Matloff are doing, explaining and arguing for the needed steps to get sails into nearby space where their value for more complex missions will be obvious.

## A2: Solar Sails Move to Slow

### **That is a popular myth—solar sails can be equipped to be fast**

Uphoff 94 (Chauncey Uphoff ACTA Consulting Group Niwot, Colorado “Very fast Solar Sails” <http://www.quarkweb.com/nqc/lib/gencoll/FastSolarSailsPaper.pdf> //Donnie)

One of the myths that has accompanied the paper development of the solar sail in the literature is that they are very slow, suitable only for very long trips to carry n o n perishable supplies and equipment. There is a good reason for this myth. The v a l u e of scientific or life-support spacecraft is normally measured in the mass required to acquire certain traditional measurements, typically video images, or to support life for a given amount of time. Therefore, when analysts in the past have put forth designs for solar sailing spacecraft, the designs have been very heavily loaded wi th traditional instruments and power systems. For these designs, the characteristic accelerations of the spacecraft have been very low so as to trade time for payload. In this paper, it is pointed out that solar sails need not be slow. Indeed, they can be designed to provide incredibly fast transfers for small payloads. Following suggestions by Forward, Dyson, and Drexler, we examine the limits of what can be done if payload mass can be reduced to a minimum. In some cases, the sail itself can be the payload, acting as an antenna or reflector for radiation generated near the center of the solar system. In such cases, spacecraft can reach 100 au in about 3.6 years. Such probes may permit the determination of the gravitational structure of the Öort cloud.

## A2: Tears

### Solar sails will be made with durable metal making tears unlikely

Vulpetti et al. 8 (Giovanni Vulpetti, Ph.D. in Plasma Physics, consultant at ESA/ESTEC for Daedalus and consultant at NASA/MSFC for Interstellar Probe, Charles L. Johnson, NASA Physicist & Deputy Manager for the Advanced Concepts Office at the NASA George C. Marshall Space Flight Center, Gregory L. Matloff, emeritus associate and adjunct associate professor of physics at New York City College of Technology and consultant for the NASA Marshall Space Flight Center, 2008, Solar Sails: A Novel Approach to Interplanetary Travel.

An optimized interstellar solar sail probably would be constructed in space using a nanometers-thin monolayer of a highly reflective, temperature-tolerant material—possibly a metal such as beryllium, aluminum, or niobium. The sail would be affixed to the payload utilizing cables with the tensile strength of diamond or silicon carbide.

In operation, a partially unfurled sail might be mounted behind a chunk of asteroid that has been machined to serve as a sunshade. The sail and occulting sunshade would then be injected into a parabolic solar orbit with a perihelion solar distance measured in millions of kilometers.

## A2: Implementation Slow/Delay

### **Solar sails can be at the end of the solar system in four years—your aff takes a longer time.**

Uphoff 94 (Chauncey Uphoff ACTA Consulting Group Niwot, Colorado “Very fast Solar Sails” <http://www.quarkweb.com/nqc/lib/gencoll/FastSolarSailsPaper.pdf> //Donnie)

It has been suggested that the development of very high-performance light-sails is easily within the capabilities of our technology. Such sails could be used in a variety of experiments to study the gravitational and magnetic structure of the outer solar system, as well as to enhance the performance of the well-documented applications for interplanetary transportation. It was pointed out that such sails can reach Pluto' s orbit, carrying a 100 kg science payload, in about one year and could reach the outer limits of the solar system within about 4 years. A suggestion was made for a very simple, and relatively inexpensive "retro-reflector" made of thousands of trillions of needles to form an immense "cloud" of tiny antennae that could reflect the unique signal produced by the sun at particular lines in the solar spectrum. Such an experiment might reveal the magnetic and gravitational structure of the "heliopause" - - the supposed region near the shock wave caused by the interaction of the sun's magnetic field with the interstellar medium. Such an experiment might uncover facts more astonishing than the discovery of the Earth's Van Allen radiation belts. The time scale of the trajectories is much less than that required of most governments to establish and obtain funding for deep-space projects.

## A2: CP Doesn’t Get Deep Enough Into Space

### **<<Insert cp solves colonization business>>**

### **And, going deep with your aff means alien contact**

Downey et al. 4 (James R. Downey, Lt Col, USAFR Anthony M. Forestier, Wg Cdr. RAAF David E. Miller, Lt Col, USAF “FLYING REACTORS: THE POLITICAL FEASIBILITY OF NUCLEAR POWER IN SPACE” <http://www.fas.org/nuke/space/downey.pdf> //Donnie)

For over thirty years, NASA has relied on the same set of power and propulsion systems to explore the solar system and beyond. Project Prometheus is the investment necessary if NASA is to take a major step forward in our quest to explore our solar system and search for life, and through its groundbreaking technologies and missions would provide an inspiration to the next generation of students and explorers.

### **Extinction-our evidence quotes Stephen Hawking**

ABC News 10 (“Stephen Hawking: Alien Contact Could Be Risky” <http://abcnews.go.com/Technology/Space/stephen-hawking-alien-contact-risky/story?id=10478157> //Donnie)

Alien encounters may seem like sure-fire winners to Hollywood, but one of the world's most famous scientists thinks they may be "too risky" be be worth seeking. In a new Discovery Channel documentary, which premiered Sunday night, British astrophysicist Stephen Hawking said that communicating with aliens could be a threat to Earth. Hawking said it is likely that alien life exists, but a visit from extraterrestrials might be similar to Christopher Columbus' arrival in the Americas. "If aliens visit us, the outcome would be much as when Columbus landed in America, which didn't turn out well for the Native Americans," he said. "We only have to look at ourselves to see how intelligent life might develop into something we wouldn't want to meet." In the new program, "Into the Universe with Stephen Hawking," he speculated that aliens' capabilities "would be only limited by how much power they could harness and control, and that could be far more than we might first imagine." He said it might even be possible for aliens to harvest the energy from an entire star. "Such advanced aliens would perhaps become nomads, looking to conquer and colonize whatever planets they can reach," Hawking said.

# Accidents DA

## 1NC—Nuclear Accidents DA

### **The plan causes accidents that risk extinction, nuclear prolif, and terrorism—this turns the case because it shuts down NASA. Solar power solves.**

Grossman 11 (Karl Grossman, professor of journalism at the State University of New York/College of New York, is the author of the book, The Wrong Stuff: The Space's Program's Nuclear Threat to Our Planet (Common Courage Press) and wrote and presented the TV program Nukes In Space: The Nuclearization and Weaponization of the Heavens (<http://www.envirovideo.com>). “What Could Truly End the Space Program: A Nuclear Disaster Overhead” <http://www.opednews.com/articles/What-Could-Truly-End-the-S-by-Karl-Grossman-110721-80.html> //Donnie)

What is NASA's future now that Atlantis has landed and the shuttle program is over? If NASA persists in using nuclear power in space, the agency's future is threatened. Between November 25 and December 15 NASA plans to launch for use on Mars a rover fueled with 10.6 pounds of plutonium, more plutonium than ever used on a rover. The mission has a huge cost: $2.5 billion. But if there is an accident before the rover is well on its way to Mars, and plutonium is released on Earth, its cost stands to be yet more gargantuan. NASA's Final Environmental Impact Statement for what it calls its Mars Science Laboratory Mission says that if plutonium is released on Earth, the cost could be as high as $1.5 billion to decontaminate each square mile of "mixed-use urban areas" impacted. What"s the probability of an accident releasing plutonium? The NASA document says "the probability of an accident with a release of plutonium" is 1-in-220 "overall." If you knew your chance of not surviving an airplane flight--or just a drive in a car--was 1 in 220, would you take that trip? And is this enormous risk necessary? In two weeks, there'll be a NASA mission demonstrating a clear alternative to atomic energy in space: solar power. On August 5, NASA plans to launch a solar-powered space probe it's named Juno to Jupiter. There's no atomic energy involved, although NASA for decades has insisted that nuclear power is necessary for space devices beyond the orbit of Mars. With Juno, NASA will be showing it had that wrong. "Juno will provide answers to critical science questions about Jupiter, as well as key information that will dramatically enhance present theories about the early formation of our own solar system," says NASA on its website. "In 2016, the spinning, solar-powered Juno spacecraft will reach Jupiter." It will be equipped with "instruments that can sense the hidden world beneath Jupiter's colorful clouds" and make 33 passes of Jupiter. As notes Aviation Week and Space Technology: "The unique spacecraft will set a record by running on solar power rather than nuclear radioisotope thermoelectric generators previously used to operate spacecraft that far from the Sun." The Mars rover to be launched, named Curiosity by NASA, will be equipped with these radioisotope thermoelectric generators using plutonium, the deadliest radioactive substance. Juno, a large craft--66-feet wide--will be powered by solar panels built by a Boeing subsidiary, Spectrolab. The panels can convert 28 percent of the sunlight that them to electricity. They'll also produce heat to keep Juno's instruments warm. This mission's cost is $1.1 billion. In fact, Juno is not a wholly unique spacecraft. In 2004, the European Space Agency launched a space probe called Rosetta that is also solar-powered. Its mission is to orbit and land on a comet--beyond the orbit of Jupiter. Moreover, there have been major developments in "solar sails" to propel spacecraft. Last year, the Japan Aerospace Exploration Agency launched its Ikaros spacecraft with solar sails taking it to Venus. In January, NASA itself launched its NanoSail-D spacecraft. The Planetary Society has been developing several spacecraft that will take advantage of photons emitted by the Sun to travel through the vacuum of space. At no point will Juno (or the other solar spacecrafts) be a threat to life on Earth. This includes Juno posing no danger when in 2013 it makes a flyby of Earth. Such flybys making use of Earth's gravity to increase a spacecraft's velocity have constituted dangerous maneuvers when in recent years they've involved plutonium-powered space probes such as NASA's Galileo and Cassini probes. Curiosity is a return to nuclear danger. NASA's Final Environmental Impact statement admits that a large swath of Earth could be impacted by plutonium in an accident involving it. The document's section on "Impacts of Radiological Releases" says "the affected environment" could include "the regional area near the Cape Canaveral Air Force Station and the global area." "Launch area accidents would initially release material into the regional area, defined"to be within "62 miles of the launch pad," says the document. This is an area from Cape Canaveral west to Orlando. But "since some of the accidents result in the release of very fine particles less than a micron in diameter, a portion of such releases could be transported beyond"62 miles," it goes on. These particles could become "well-mixed in the troposphere"--the atmosphere five to nine miles high--"and have been assumed to potentially affect persons living within a latitude band from approximately 23-degrees north to 30-degrees north." That's a swath through the Caribbean, across North Africa and the Mideast, then India and China Hawaii and other Pacific islands, and Mexico and southern Texas. Then, as the rocket carrying Curiosity up gains altitude, the impacts of an accident in which plutonium is released would be even broader. The plutonium could affect people "anywhere between 28-degrees north and 28-degrees south latitude," says the NASA document. That's a band around the mid-section of the Earth including much of South America, Africa and Australia. Dr. Helen Caldicott, president emeritus of Physicians for Social Responsibility, has long emphasized that a pound of plutonium if uniformly distributed could hypothetically give a fatal dose of lung cancer to every person on Earth. A pound, even 10.6 pounds, could never be that uniformly distributed, of course. But an accident in which plutonium is released by a space device as tiny particles falling to Earth maximizes its lethality. A millionth of a gram of plutonium can be a fatal dose. The pathway of greatest concern is the breathing in plutonium particle.. As the NASA Environmental Impact Statement puts it: "Particles smaller than about 5 microns would be transported to and remain in the trachea, bronchi, or deep lung regions." The plutonium particles "would continuously irradiate lung tissue." "A small fraction would be transported over time directly to the blood or to lymph nodes and then to the blood," it continues. Once plutonium "has entered the blood via ingestion or inhalation, it would circulate and be deposited primarily in the liver and skeletal system." Also, says the document, some of the plutonium would migrate to the testes or ovaries. The cost of decontamination of areas affected by the plutonium could be, according to the NASA statement, $267 million for each square mile of farmland, $478 million for each square mile of forests and $1.5 billion for each square mile of "mixed-use urban areas." The NASA document lists "secondary social costs associated with the decontamination and mitigation activities" as: "Temporary or longer term relocation of residents; temporary or longer term loss of employment; destruction or quarantine of agricultural products including citrus crops; land use restrictions which could affect real estate values, tourism and recreational activities; restriction or bands on commercial fishing; and public health effects and medical care." As to why the use of a plutonium-powered rover on Mars--considering that NASA has successfully used solar-powered rovers on Mars--the NASA Environmental Impact Statement says that a "solar-powered rover"would not be capable of operating over the full range of scientifically desirable landing site latitudes" on this mission. There's more to it. For many decades there has been a marriage of nuclear power and space at NASA. The use of nuclear power on space missions has been heavily promoted by the U.S. Department of Energy and its predecessor agency, the U.S. Atomic Energy Commission, and the many DOE (previously AEC) national laboratories including Los Alamos and Oak Ridge. This provides work for these government entities. Also, the manufacturers of nuclear-powered space devices--General Electric was a pioneer in this--have pushed their products. Further, NASA has sought to coordinate its activities with the U.S. military. The military for decades has planned for the deployment of nuclear-powered weapons in space. Personifying the NASA-military connection now is NASA Administrator Charles Bolden, a former NASA astronaut and Marine Corps major general. Appointed by President Barack Obama, he is a booster of radioisotope thermoelectric generators as well as rockets using nuclear power for propulsion. The U.S. has spent billions of dollars through the years on such rockets but none have ever taken off and the programs have all ended up cancelled largely out of concern about a nuclear-powered rocket blowing up on launch or falling back to Earth. Accidents have happened in the U.S. space nuclear program. Of the 26 space missions that have used plutonium which are listed in the NASA Environmental Impact Statement for the Mars Science Laboratory Mission, three underwent accident, admits the document. The worst occurred in 1964 and involved, it notes, the SNAP-9A plutonium system aboard a satellite that failed to achieve orbit and dropped to Earth, disintegrating as it fell. The 2.1 pounds of plutonium fuel dispersed widely over the Earth and Dr. John Gofman, professor of medical physics at the University of California at Berkeley, long linked this accident to an increase in global lung cancer. With the SNAP-9A accident, NASA switched to solar energy on satellites. Now all satellites--and the International Space Station--are solar-powered. There was a near-miss involving a nuclear disaster and a space shuttle. The ill-fated Challenger's next mission in 1986 was to loft a plutonium-powered space probe. The NASA Environmental Impact Statement includes comments from people and organizations some highly critical of a plutonium-powered Mars Science Laboratory Mission. Leah Karpen of Asheville, North Carolina says: "Every expansion of plutonium research, development and transportation of this deadly material increases the risk of nuclear accident or theft. In addition, plutonium production is expensive and diverts resources from the more important social needs of our society today, and in the future." She urges NASA "to reconsider the use of nuclear" and go with solar instead. Jeremy Maxand, executive director of the Idaho-based Snake River Alliance, calls on NASA and the Department of Energy to "take this opportunity to move space exploration in a sustainable direction with regard to power. Using solar rather than nuclear to power the Mars Science Laboratory Mission would keep the U.S. safe, advance energy technologies that are cleaner and more secure, be more fiscally responsible, and set a responsible example to other countries as they make decisions about their energy future." Ace Hoffman of Carlsbad, California speaks of "today's nuclear NASA" and a "closed society of dangerous, closed-minded "scientists' who are hoodwinking the American public and who are guilty of premeditated random murder." He adds: "The media has a duty to learn the truth rather than parrot NASA's blanketly-false assertions." NASA, in response to the criticisms, repeatedly states in the document: "NASA and the DOE take very seriously the possibility that an action they take could potentially result in harm to humans or the environment. Therefore, both agencies maintain vigorous processes to reduce the potential for such events." Involved in challenging the mission is the Global Network Against Weapons & Nuclear Power in Space (www.space4peace.org). Bruce Gagnon, coordinator of the Maine-based organization, says that " NASA sadly appears committed to maintaining their dangerous alliance with the nuclear industry. Both entities view space as a new market for the deadly plutonium fuel." Says Gagnon: "The taxpayers are being asked once again to pay for nuclear missions that could endanger the life of all the people on the planet "Have we not learned anything from Chernobyl and Fukushima? We don't need to be launching nukes into space. It's not a gamble we can afford to take." With the return of Atlantis and end of the shuttle program, there are concerns about this being the "end" of the U.S. space program. An accident if NASA continues to insist on mixing atomic energy and space--a nuclear disaster overhead--that, indeed, could end the space program.

### **NASA is key to the economy**

SpaceMart 9 (“Investment In Space Critical For US Economic Growth And Competitiveness” <http://www.spacemart.com/reports/Investment_In_Space_Critical_For_US_Economic_Growth_And_Competitiveness_999.html> //Donnie)

The Space Economy Symposium, an initiative of George Mason University in collaboration with Phillips and Company and hosted by the Space Enterprise Council of the U.S. Chamber of Commerce, provided a forum for a robust discussion on the contributions of space to the nation's economic growth and the role of space in enabling greater national competitiveness in a global economy. "Keeping NASA funded at its highest levels is paramount to the success of America, **creating jobs for our struggling economy and keeping us on the frontline of space exploration,"** said Congressman Parker Griffith (D-AL) in his keynote remarks. "A well-funded space program is one of the many things that can help provide a needed jump start to our struggling economy," said Griffith, a member of the Science and Technology Committee and the Subcommittee on Space and Aeronautics in the U.S. House of Representatives. His district includes Huntsville, AL, the home of NASA's Marshall Space Flight Center. Two panels of experts presented recent research and analysis of the space economy and discussed its effect on the broader economy including areas such as the environment, energy, communications, and technology development. They also discussed new space infrastructure development, including communications, earth observations, launch systems and commercial exploration and what these new systems and infrastructure will mean in terms of benefiting Earth and enabling more affordable utilization and exploration of space. Among the research presented was a study introduced at the symposium by the international consulting firm Oxford Analytica. Entitled "Understanding the Space Economy," the study predicts the space industry will reach more than $1 trillion by 2020. The study finds that space is **a critically important contributor** to the global economy: "**Remove the space dimension and the world would lose much of the growth that it has experienced in the last 50 years**." Barrie Stevens, Deputy Director, International Futures Program at the Organization for Economic Cooperation and Development (OECD) discussed the OECD report "The Space Economy at a Glance," a "first ever statistical overview of the emerging space economy." The study finds that "over coming decades, space-related applications, such as distance education, telemedicine, precision farming, land-use management, and monitoring of various international treaties, will continue to hold great socioeconomic promise."

### Nuclear war

Auslin and Lachman, 9 [Michael Auslin is a resident scholar and Desmond Lachman is a resident fellow at the American Enterprise Institute,“ The Global Economy Unravels,” 3/6/2009, http://www.forbes.com/2009/03/06/global-economy-unravels-opinions-contributors-g20.html]

What do these trends mean in the short and medium term? The Great Depression showed how social and global chaos followed hard on economic collapse. The mere fact that parliaments across the globe, from America to Japan, are unable to make responsible, economically sound recovery plans suggests that they do not know what to do and are simply hoping for the least disruption. Equally worrisome is the adoption of more statist economic programs around the globe, and the concurrent decline of trust in free-market systems. The threat of instability is a pressing concern. China, until last year the world's fastest growing economy, just reported that 20 million migrant laborers lost their jobs. Even in the flush times of recent years, China faced upward of 70,000 labor uprisings a year. A sustained downturn poses grave and possibly immediate threats to Chinese internal stability. The regime in Beijing may be faced with a choice of repressing its own people or diverting their energies outward, leading to conflict with China's neighbors. Russia, an oil state completely dependent on energy sales, has had to put down riots in its Far East as well as in downtown Moscow. Vladimir Putin's rule has been predicated on squeezing civil liberties while providing economic largesse. If that devil's bargain falls apart, then wide-scale repression inside Russia, along with a continuing threatening posture toward Russia's neighbors, is likely. Even apparently stable societies face increasing risk and the threat of internal or possibly external conflict. As Japan's exports have plummeted by nearly 50%, one-third of the country's prefectures have passed emergency economic stabilization plans. Hundreds of thousands of temporary employees hired during the first part of this decade are being laid off. Spain's unemployment rate is expected to climb to nearly 20% by the end of 2010; Spanish unions are already protesting the lack of jobs, and the specter of violence, as occurred in the 1980s, is haunting the country. Meanwhile, in Greece, workers have already taken to the streets. Europe as a whole will face dangerously increasing tensions between native citizens and immigrants, largely from poorer Muslim nations, who have increased the labor pool in the past several decades. Spain has absorbed five million immigrants since 1999, while nearly 9% of Germany's residents have foreign citizenship, including almost 2 million Turks. The xenophobic labor strikes in the U.K. do not bode well for the rest of Europe. A prolonged global downturn, let alone a collapse, would dramatically raise tensions inside these countries. Couple that with possible protectionist legislation in the United States, unresolved ethnic and territorial disputes in all regions of the globe and a loss of confidence that world leaders actually know what they are doing. The result may be a series of small explosions that coalesce into a big bang.

## Link/Impact Evidence

### Reject their evidence, its military spin, the aff exponentially increases the risk the accidents, those gut the ecosystem and cause extinction, independently trades off with environmental protection funds.

Gagnon 3 (Bruce Gagnon, Coordinator, Global Network Against Weapons & Nuclear Power in Space “Bush Expanding Nuclear Power for Space: Threatens Planetary Ecosystem” <http://www.greens.org/s-r/30/30-13.html> //Donnie)

After a 30-year shutdown of plans for the nuclear rocket, the Bush administration has resuscitated the technology by giving NASA nearly $1 billion to expand space nuclear and propulsion research and development. “We are still doing exploration of our solar system in covered wagons,” says Ed Weiler, NASA’s Space Science Chief. “The Nuclear Systems Initiative will open up the railroad.” Included in NASA plans are the nuclear rocket to Mars; a new generation of Radioisotope Thermo-electric Generators (RTGs) for interplanetary missions; nuclear-powered robotic Mars rovers to be launched in 2003 and 2009; and the nuclear powered mission called Pluto-Kuiper Belt scheduled for January, 2006. NASA envisions mining colonies on the Moon (for helium 3 and water), Mars (magnesium, cobalt, and uranium) and asteroids (gold) powered by nuclear reactors launched from the Kennedy Space Center in Florida on rockets with a historic 10% failure rate. By exponentially increasing the number of nuclear launches NASA also exponentially increases the chances of accident. During the 1950s and 1960s NASA spent over $10 billion to build the nuclear rocket program canceled in the end because a launch accident would contaminate major portions of Florida and beyond. By exponentially increasing the number of nuclear launches NASA also exponentially increases the chances of accident. NASA’s expanded focus on nuclear power in space “is not only dangerous but politically unwise,” says Dr. Michio Kaku, professor of nuclear physics at the City University of New York. “The only thing that can kill the US space program is a nuclear disaster…a Chernobyl in the sky.” “NASA hasn’t learned its lesson from its history,” says Kaku, “and a hallmark of science is that you learn from previous mistakes. NASA doggedly pursues its fantasy of nuclear power in space.” Since the 1960s there have been eight space nuclear power accidents by the US and the former Soviet Union, several of which released deadly plutonium. In April, 1964 a US military satellite with 2.1 pounds of plutonium-238 on board fell back to Earth and burned up as it hit the atmosphere, spreading the toxic plutonium globally as dust to be ingested by the people of the planet. In 1997 NASA launched the Cassini space probe carrying 72 pounds of plutonium that fortunately did not experience failure. Hundreds of thousands of people could have been contaminated. Last year the Department of Energy (DoE) and NASA announced that present facilities must be expanded. The DoE will spend over $35 million to renovate the Oak Ridge National Laboratory in Tennessee to help with space plutonium production. Oak Ridge workers would purify the plutonium, which then would be shipped to Los Alamos National Laboratory in New Mexico where it would be formed into pellets used in space power systems. Historically DoE has a bad track record when it comes to protecting workers and local water systems from radioactive contaminants. Serious questions need to be asked: How will workers be protected? Where will they test the nuclear rocket? How much will it cost? What would be the impacts of a launch accident? Critics of NASA have long stated that the NASA space nukes initiative represents the Bush administration’s covert move to develop power systems for space-based weapons. The military has often stated that their planned lasers in space will require enormous power projection capability and nuclear reactors in orbit would provide such power. In April, 1964 a US military satellite with 2.1 pounds of plutonium-238 on board fell back to Earth and burned up as it hit the atmosphere… “You can’t differentiate between…military application and those capabilities which are civil and commercial in nature.” The Global Network Against Weapons & Nuclear Power in Space maintains that missile defense is a Trojan horse for the Pentagon’s control and domination of space, and NASA’s nuclear rocket is a Trojan horse for the militarization of space. NASA’s new chief, former Navy Secretary Sean O’Keefe said, “I think it’s imperative we have a more direct association between the Defense Department and NASA. … You can’t differentiate between…military application and those capabilities which are civil and commercial in nature.” In the end hundreds and hundreds of billions of dollars will be wasted on plans for the nuclearization and weaponization of space. In order to fund these missions Bush and Congress will cut programs like social security, education, health care, child care, public transit and environmental protection. The lives of future generations will become more insecure. For the third year in a row the Global Network (GN) will organize two days of protests on February 3–4, 2003 in Albuquerque, N.M. at the 20th Annual Symposium on Space Nuclear Power & Propulsion. This event draws the top players from NASA, DoE, DoD, nuclear academia and nuclear aerospace each year to plan the push of nuclear power into space. Hundreds of middle and high school students are brought to the symposium for indoctrination and the GN has been able to speak to many of these young people at our protests. NASA, DoE, and the Pentagon are not asking the public if we want to suffer the risk and costs of nuclear power in space. Their corporate and military interests make it necessary to push ahead without public debate. Their plans threaten the life of the entire planetary ecosystem. The time has come for vigorous organizing around the space nuclear power issue.

### Even if you prove there is a low risk in the short term, you make accidents inevitable sometime.

Grossman 91 ( Karl Grossman, professor of journalism at the State University of New York/College of New York, is the author of the book, The Wrong Stuff: The Space's Program's Nuclear Threat to Our Planet (Common Courage Press) and wrote and presented the TV program Nukes In Space: The Nuclearization and Weaponization of the Heavens (http://www.envirovideo.com). “We Don't Need Reactors in Space Ignoring safe solar power, we send plutonium-laden probes into orbit” <http://www.flybynews.com/archives/karl/kg9105we.htm> //Donnie)

The United States is proceeding rapidly with the nuclearization of space, and the threat we face from Galileo is the kind of danger we will be undergoing constantly if we allow the government to continue to send nuclear hardware into space. If we tolerate Chernobyls in the sky, deadly accidents will be inevitable. Yet this risk is unnecessary. The potential catastrophes are avoidable. After Galileo was launched in 1989, I received, under the Freedom of Information Act, NASA-funded studies declaring that nuclear power was not necessary to generate electricity on the Galileo mission; solar energy would do. The plutonium on board Galileo is being used not for propulsion but as fuel in generators providing a mere 560 watts of electricity for the probe's instruments -Ä electricity that could be produced instead by solar energy. A decade ago NASA's Jet Propulsion Laboratory concluded: "A Galileo Jupiter-orbiting mission could be performed with a concentrated photovoltaic solar array [panels converting sunlight to electricity] power source without changing the mission sequence or impacting science objectives." Five years ago, another JPL study said that it would take only two to three years to build the alternative solar-power source. Still another JPL report stressed that using the sun for power would cost less than using plutonium. It is humanity's destiny to explore the heavens, but what a folly it will be if in doing this, we needlessly cause the deaths of tens of thousands of people and contaminate the Earth with deadly plutonium. The federal government and its national laboratories, zealous about nuclear power of all sorts, are pushing nuclear technology in space. So are space contractors such as General Electric, which produces nuclear space devices (including those on Galileo) and is having a hard time peddling nuclear power for use on Earth.

## A2: History Proves It Is Not Bad

### Your track record is poorer than Amy Whinehouse—your aff makes an earth bound tumble inevitable

Grossman 91 ( Karl Grossman, professor of journalism at the State University of New York/College of New York, is the author of the book, The Wrong Stuff: The Space's Program's Nuclear Threat to Our Planet (Common Courage Press) and wrote and presented the TV program Nukes In Space: The Nuclearization and Weaponization of the Heavens (http://www.envirovideo.com). “We Don't Need Reactors in Space Ignoring safe solar power, we send plutonium-laden probes into orbit” <http://www.flybynews.com/archives/karl/kg9105we.htm> //Donnie)

The record of nuclear power in space is poor. The United States has launched 24 nuclear-fueled space devices, including a navigational satellite with plutonium aboard that disintegrated in the atmosphere as it plunged to Earth in 1964. The U.S. failure rate for nuclear-powered space devices has been about 15 percent. The Soviet Union has the same failure rate. The Soviets have sent up more than 30 nuclear-fueled devices, including the Kosmos 954, which littered a broad swath of Canada with radioactive debris when it crashed in 1978. The United States spent some $2 billion of taxpayer money on developing nuclear-powered rockets from 1955 to 1973, but none ever got off the ground. That effort was finally canceled because of the concern that a rocket might crash to Earth. Now we're turning to nuclear power in space -- with its inevitable mishaps -- again. Last year the United States launched the Ulysses plutonium-fueled probe to survey the sun. A December Associated Press dispatch noted, "The Ulysses spacecraft is wobbling like an off-balance washing machine, threatening to cripple the $760-million mission." Fortunately, the probe is not coming back for an Earth flyby.

## Accidents Turn Case

### NASA will end, the public wont stand for its, that’s Grossman, here is more evidence.

Grossman 11 (Karl Grossman, professor of journalism at the State University of New York/College of New York, is the author of the book, The Wrong Stuff: The Space's Program's Nuclear Threat to Our Planet (Common Courage Press) and wrote and presented the TV program Nukes In Space: The Nuclearization and Weaponization of the Heavens (<http://www.envirovideo.com>). “What Could Truly End the Space Program: A Nuclear Disaster Overhead” <http://www.opednews.com/articles/What-Could-Truly-End-the-S-by-Karl-Grossman-110721-80.html> //Donnie)

What is NASA’s future now that Atlantis has landed and the shuttle program is over? If NASA persists in using nuclear power in space, the agency’s future is threatened. Between November 25 and December 15 NASA plans to launch for use on Mars a rover fueled with 10.6 pounds of plutonium, more plutonium than ever used on a rover. The mission has a huge cost: $2.5 billion. But if there is an accident before the rover is well on its way to Mars, and plutonium is released on Earth, its cost stands to be yet more gargantuan. NASA’s Final Environmental Impact Statement for what it calls its Mars Science Laboratory Mission says that if plutonium is released on Earth, the cost could be as high as $1.5 billion to decontaminate each square mile of “mixed-use urban areas” impacted.

## Solar Avoids The DA

### The DA is a net-benefit to the counterplan—risk of the impact outweighs any potential solvency deficit.

Grossman 3 (Karl Grossman, professor of journalism at the State University of New York/College at Old Westbury, is the author of The Wrong Stuff: The Space Program’s Nuclear Threat To Our Plane t (Common Courage Press). “Nukes-in-Space in Columbia's Wake NASA broadens its nuclear power in space program with Project Prometheus”

“Why on Earth,” asks Alice Slater, president of the New York-based Global Resource Action Center for the Environment and a Global Network board member, “would any sane person propose to take nuclear poisons to a whole new level?” “Nuclear power whether in space or on Earth is a risky business,” says Sally Light, long-time executive director of the anti-nuclear Nevada Desert Experience and also a Global Board member, “whether in space or on earth is a risky business. Why is the U.S. blindly plunging ahead with such a potentially disastrous and outmoded concept? We should use solar-powered technologies as they are clean, safe and feasible.” The commitment of huge amounts of money to the Nuclear Systems Initiative, now Project Prometheus, “is unconscionable. Did the people of Earth have a voice in this? One of the basic principles of democracy is that those affected have a determinative role in the decision-making process. We in the U.S. and people worldwide are faced with a dangerous, high-risk situation being forced on us and on our descendents.”

## Impact

### Nuclear meltdown cause extinction – any risk of an accident must be avoided.

**Wasserman 01**(Harvey Wasserman, senior editor of NIRS, October 2001, “America’s Terrorist Nuclear Threat to Itself” < http://www.nirs.org/reactorwatch/security/wassermannukesecurity.htm>)

The intense radioactive heat within today's operating reactors is the hottest anywhere on the planet. So are the hellish levels of radioactivity. Because Indian Point has operated so long, its accumulated radioactive burden far exceeds that of Chernobyl, which ran only four years before it exploded. Some believe the WTC jets could have collapsed or breached either of the Indian Point containment domes. But at very least the massive impact and intense jet fuel fire would destroy the human ability to control the plants' functions. Vital cooling systems, backup power generators and communications networks would crumble. Indeed, Indian Point Unit One was shut because activists warned that its lack of an emergency core cooling system made it an unacceptable risk. The government ultimately agreed. But today terrorist attacks could destroy those same critical cooling and control systems that are vital to not only the Unit Two and Three reactor cores, but to the spent fuel pools that sit on site. The assault would not require a large jet. The safety systems are extremely complex and virtually indefensible. One or more could be wiped out with a wide range of easily deployed small aircraft, ground-based weapons, truck bombs or even chemical/biological assaults aimed at the operating work force. Dozens of US reactors have repeatedly failed even modest security tests over the years. Even heightened wartime standards cannot guarantee protection of the vast, supremely sensitive controls required for reactor safety. Without continous monitoring and guaranteed water flow, the thousands of tons of radioactive rods in the cores and the thousands more stored in those fragile pools would rapidly melt into super-hot radioactive balls of lava that would burn into the ground and the water table and, ultimately, the Hudson. Indeed, a jetcrash like the one on 9/11 or other forms of terrorist assault at Indian Point could yield three infernal fireballs of molten radioactive lava burning through the earth and into the aquifer and the river. Striking water they would blast gigantic billows of horribly radioactive steam into the atmosphere. Prevailing winds from the north and west might initially drive these clouds of mass death downriver into New York City and east into Westchester and Long Island. But at Three Mile Island and Chernobyl, winds ultimately shifted around the compass to irradiate all surrounding areas with the devastating poisons released by the on-going fiery torrent. At Indian Point, thousands of square miles would have been saturated with the most lethal clouds ever created or imagined, depositing relentless genetic poisons that would kill forever. In nearby communities like Buchanan, Nyack, Monsey and scores more, infants and small children would quickly die en masse. Virtually all pregnant women would spontaneously abort, or ultimately give birth to horribly deformed offspring. Ghastly sores, rashes, ulcerations and burns would afflict the skin of millions. Emphysema, heart attacks, stroke, multiple organ failure, hair loss, nausea, inability to eat or drink or swallow, diarrhea and incontinance, sterility and impotence, asthma, blindness, and more would kill thousands on the spot, and doom hundreds of thousands if not millions. A terrible metallic taste would afflict virtually everyone downwind in New York, New Jersey and New England, a ghoulish curse similar to that endured by the fliers who dropped the atomic bombs on Hiroshima and Nagaskai, by those living downwind from nuclear bomb tests in the south seas and Nevada, and by victims caught in the downdrafts from Three Mile Island and Chernobyl. Then comes the abominable wave of cancers, leukemias, lymphomas, tumors and hellish diseases for which new names will have to be invented, and new dimensions of agony will beg description. Indeed, those who survived the initial wave of radiation would envy those who did not. Evacuation would be impossible, but thousands would die trying. Bridges and highways would become killing fields for those attempting to escape to destinations that would soon enough become equally deadly as the winds shifted. Attempts to quench the fires would be futile. At Chernobyl, pilots flying helicopters that dropped boron on the fiery core died in droves. At Indian Point, such missions would be a sure ticket to death. Their utility would be doubtful as the molten cores rage uncontrolled for days, weeks and years, spewing ever more devastation into the eco- sphere. More than 800,000 Soviet draftees were forced through Chernobyl's seething remains in a futile attempt to clean it up. They are dying in droves. Who would now volunteer for such an American task force? The radioactive cloud from Chernobyl blanketed the vast Ukraine and Belarus landscape, then carried over Europe and into the jetstream, surging through the west coast of the United States within ten days, carrying across our northern tier, circling the globe, then coming back again. The radioactive clouds from Indian Point would enshroud New York, New Jersey, New England, and carry deep into the Atlantic and up into Canada and across to Europe and around the globe again and again. The immediate damage would render thousands of the world's most populous and expensive square miles permanently uninhabitable. All five boroughs of New York City would be an apocalyptic wasteland. The World Trade Center would be rendered as unusable and even more lethal by a jet crash at Indian Point than it was by the direct hits of 9/11. All real estate and economic value would be poisonously radioactive throughout the entire region. Irreplaceable trillions in human capital would be forever lost. As at Three Mile Island, where thousands of farm and wild animals died in heaps, and as at Chernobyl, where soil, water and plant life have been hopelessly irradiated, natural eco-systems on which human and all other life depends would be permanently and irrevocably destroyed, Spiritually, psychologically, financially, ecologically, our nation would never recover. This is what we missed by a mere forty miles near New York City on September 11. Now that we are at war, this is what could be happening as you read this. There are 103 of these potential Bombs of the Apocalypse now operating in the United States. They generate just 18% of America's electricity, just 8% of our total energy. As with reactors elsewhere, the two at Indian Point have both been off-line for long periods of time with no appreciable impact on life in New York. Already an extremely expensive source of electricity, the cost of attempting to defend these reactors will put nuclear energy even further off the competitive scale. Since its deregulation crisis, California---already the nation's second-most efficient state---cut further into its electric consumption by some 15%. Within a year the US could cheaply replace virtually with increased efficiency all the reactors now so much more expensive to operate and protect. Yet, as the bombs fall and the terror escalates, Congress is fast-tracking a form of legal immunity to protect the operators of reactors like Indian Point from liability in case of a meltdown or terrorist attack. Why is our nation handing its proclaimed enemies the weapons of our own mass destruction, and then shielding from liability the companies that insist on continuing to operate them? Do we take this war seriously? Are we committed to the survival of our nation? If so, the ticking reactor bombs that could obliterate the very core of our life and of all future generations must be shut down.

## Link—Nuclear Economy

### Shifting to nuclear economy makes accident inevitable – more usage increases the probability of catastrophic meltdowns

Coplan 06 (Karl S. Coplan, Associate Professor of Law at Pace University, 2006, “The Intercivilizational Inequities of Nuclear Power Weighed Against The Intergenerational Inequities of Carbon Based Energy”)

Every operating nuclear power plant poses some risk of a severe accident, including an uncontrolled nuclear reaction that leads to core meltdown and potentially huge releases of radioactivity into the environment. The nuclear industry estimates the chances of a severe reactor accident to be about one out of every 10,000 reactor years of operation. 98 While this may sound like a small risk, it means that with 100 operating nuclear power plants in the United States, we can expect one severe accident every 100 years. If these 100 plants keep operating indefinitely into the future, or are replaced in kind to mitigate global carbon emissions, a severe reactor accident is virtually certain in this country in the future. Moreover, if we were to construct the 200 additional nuclear power plants in this country necessary to meet the Phase I carbon [\*244] reductions contemplated by the Kyoto Protocol, 99 that same one-in-ten thousand chance of a severe reactor accident would turn into an expectation of one severe reactor accident every thirty years. Combined with all the other nuclear reactors around the world - and assuming that all such reactors are at least as safe and well operated as those in the United States - severe nuclear reactor accidents would be expected to occur ever few years.

# Nuclear Power Bad

## Extinction

### Shift to nuclear power leads to extinction – cost, proliferation, risk, waste, and water consumption

Haskell 08 (Hugh Haskell, Senior Science Fellow at the Institute of Energy and Environmental Research, October 14th, 2008, “Nuclear power: the negatives.” < http://www.newsobserver.com/opinion/columns/story/1254081.html>)

CARY -- Proponents of nuclear power speak of a "nuclear renaissance." The facts show that rather than a renaissance, we face a nuclear apocalypse, heralded by, instead of the traditional four horsemen, five horsemen: cost, proliferation, risk, waste, and water consumption. Consider them individually: COST. In spite of early claims that nuclear power would be "too cheap to meter," nuclear power started out expensive, requiring large subsidies and loan guarantees from the government, and it has stayed that way. A preliminary estimate for two new 1,000 megawatt nuclear plants proposed by Progress Energy in Florida is $17 billion, and that cost is likely to grow as required revisions to Westinghouse's AP-1000 advanced reactor design add years to the time before those reactors will be ready for use. An industry estimate puts the cost of new nuclear power at 14c per kilowatt-hour, and rising -- higher than all other sources of energy except solar, whose cost is falling. Potential financiers of nuclear power remain leery -- cost and potential safety problems make the risks of new nuclear power too high. PROLIFERATION. Nuclear proliferation is a serious problem worldwide. Israel, India, South Africa and North Korea all created nuclear weapons by clandestine diversion of fissile material from their reactor programs, and Iran appears to be doing the same. The Global Nuclear Energy Partnership, sponsored by the Department of Energy, which emphasizes reprocessing of nuclear fuel for use by cooperating nations, is also a potential enabler of covert diversion of plutonium to a weapons program. RISK. Unlike other sources of energy, with nuclear power we risk catastrophic consequences from a serious accident. Although the likelihood of an accident is low, it multiplies with the addition of new plants. Our existing fleet of reactors is nearing its design lifetime, when the possibility of failures starts to increase; the new design reactors are untested and possible failure modes largely unknown. The confluence of those two factors should give everyone reason for concern. Moreover, the industry has been plagued with safety violations and accidents of varying degrees of severity. NC WARN has repeatedly documented problems in the management and operation of the Shearon Harris plant, where Progress Energy is considering building two new reactors. WASTE. Nuclear generation is the only source of electric power that creates seriously dangerous waste for which no acceptable means of disposal yet exists. Long-term storage at Yucca Mountain in Nevada is mired in bureaucratic, political, cost and scientific quagmires, and its opening, if ever, is now 2020 or later, by which time there will be enough waste stored at reactor sites around the country to fill it, even if we build no new reactors. Geologists have raised legitimate concerns about the feasibility of Yucca Mountain to protect the material stored there for the requisite thousands of years. DOE admits that it must create "engineered" barriers within the storage area to prevent leakage into local ground water -- the natural barriers assumed to exist when Yucca Mountain was chosen have been shown to be inadequate. Meanwhile waste has nowhere to go and piles up at reactors, becoming an increasingly attractive target for terrorists. WATER. Keeping the reactor cool and condensing the steam from the generating turbines demand a large and reliable supply of water -- upwards of 20 million gallons of water is evaporated into the atmosphere daily from a typical nuclear plant with a closed-cycle cooling system. According to Progress Energy, operating the two proposed reactors at Shearon-Harris would require raising the level of Harris Lake by 20 feet (thereby intercepting runoff that would otherwise go to the Cape Fear River) to provide sufficient cooling water. Replacing the water evaporated in the cooling process will require withdrawing up to 87 million gallons per day from the Cape Fear River itself. During times of water scarcity, reactors may have to be shut down for safety reasons, as happened at the Browns Ferry reactor in Alabama during the 2007 drought. In addition, cooling water discharged into a river or the ocean re-enters the stream at a higher temperature which can have detrimental effects on downstream marine life. One must wonder how a problematic and expensive technology, whose increased capacity will not be effective for at least 10 years, can help us meet a crisis whose solution must begin today, when existing clean and safe technologies that can be providing increasing capacity during the next 10 years await only a nod of approval from the energy companies that can make it happen.

## Prevents Space Colonization

### Expansion of nuclear power guarantees extinction – prevents space colonization

Pwanson 09 (Saul Pwanson, software engineer, January, 29th, 2009, “Why Nuclear Power Dooms Humanity to Extinction” < http://saulpwanson.com/2009/why-nuclear-power-dooms-humanity-to-extinction>)

Recently, I discovered John McCarthy’s (creator of LISP) pages on sustainability that he’s been working on for many years. Prof. McCarthy is a proponent of using nuclear energy to achieve sustainability on this planet, and he has a lot of good information on his site. According to him, we’ll enjoy perhaps a billion years of sustainable energy with the nuclear fission available from materials on this planet. He also thinks conservation of energy (applying mental effort and resources to the reduction of energy consumption) is a huge mistake. I too think nuclear energy is an important energy source to explore, but I am not as “extremely optimistic” as Prof. McCarthy. Conservation of energy, particularly fissionable materials, is not a huge mistake. My argument is: The amount of fissionable nuclear material on the planet right now (and indeed, in the solar system) is the most there will ever be. Fissionable elements decay at a fixed rate, and new heavy elements are only created in a star’s death. Energy consumption has historically grown at a pace faster than population growth. In addition, cheap energy makes people optimize other (larger) economic factors. In other words, when gasoline prices are cheap and stable, people will move further from cities, where housing prices are cheaper, and consume more fuel in transportation between the city and themselves. This leads to energy consumption expanding to consume any additional supply. Space travel is widely recognized as the only infinite-horizon survival mechanism, for any life form (or: any life form that is confined to a single planet is doomed to extinction in the longest term). The more we understand about physics, the more we are certain that the theories of relativity are true. There don’t seem to be any shortcuts to getting around the universe; it just takes a huge amount of time and energy. The biggest misconception that most people have is exactly how much energy or time it would take to move a sustainable colony from the earth to another solar system (and no other planets in our solar system seem to be habitable). It is several orders of magnitude larger than traveling within our solar system, which is already almost prohibitive to do via chemical propulsion. Human interstellar travel using chemical energy is basically impossible. Well, nuclear fission has 10 million times (7 orders of magnitude) more energy than chemical reactions. The power and energy density in nuclear material makes it ideal as a portable long-distance fuel. Other energy conveyances for interstellar transport have been proposed, but every one is almost as ridiculous as using the LHC to construct our own personal wormhole. (Fusion has the capability to generate even more energy, and the materials are abundant, but it’s pretty much not going to work out for energy production either). The huge amount of energy required to get to another star in a “reasonable” amount of time (only hundreds of years) means that it’ll even take a fair amount of fission fuel. So, consuming nuclear fuel to satisfy our insatiable thirst for domestic energy may prevent us from ever leaving this planet. And our continuing disregard for the potential long-term effects of our short-term actions will very likely amplify those negative long-term effects. Nuclear haste makes nuclear waste. Don’t get me wrong: we absolutely need to continue developing fission technology, for both space travel and energy emergencies here on earth (heaven forbid the aliens come and we don’t have powerful enough lasers to destroy them). This development should go beyond theoretical research, to large-scale engineering and “field tests” that may as well be used as civilian energy sources. But to retool our civilization’s energy infrastructure to rely on “abundant” nuclear energy is a huge mistake: without active conservation, our consumption will grow to take advantage of as much energy as we can produce, we’ll be consuming a fuel that is absolutely finite, and that fuel won’t be available when the asteroid is 50 years away and we really do need to get off the planet. And that’s why abundant nuclear power ultimately dooms humanity to extinction.

## Kills The Ozone Layer

### Nuclear power destroys the ozone layer

Caldicott 06 (Helen Caldicott, founder and president of the Nuclear Policy Research Institute, 2006, “Nuclear Power is not the answer, <http://calitreview.com/19>)

Nuclear power is not "clean and green," as the industry claims, because large amounts of traditional fossil fuels are required to mine and refine the uranium needed to run nuclear power reactors, to construct the massive concrete reactor buildings, and to transport and store the toxic radioactive waste created by the nuclear process. Burning of this fossil fuel emits significant quantities of carbon dioxide (C02)-the primary "greenhouse gas"-into the atmosphere. In addition, large amounts of the now-banned chlorofluorocarbon gas (CFC) are emitted during the enrichment of uranium. CFC gas is not only 10,000 to 20,000 times more efficient as an atmospheric heat trapper ("greenhouse gas") than CO2, but it is a classic "pollutant" and a potent destroyer of the ozone layer.

### [Insert Extinction Impact from Ozone DA]

## Proliferation

### Nuclear infrastructure leads to prolif – becomes widespread

Deutch 03 (John Deutch, Institute Professor of Chemistry at MIT, 2003, "The Future of Nuclear Power," Interdisciplinary Study, <http://web.mit.edu/nuclearpower/pdf/nuclearpower-full.pdf>)

Nuclear weapons proliferation has been prominent in discussions about nuclear power since its earliest days. The birth of nuclear technology that began with production of the first weapons-usable fissionable material - plutonium production in nuclear reactors and high enriched uranium by isotope enrichment assured that this would be so. Today, the objective is to minimize the proliferation risks of nuclear fuel cycle operation. We must prevent the acquisition of weapons-usable material, either by diversion (in the case of plutonium) or by misuse of fuel cycle facilities (including related facilities, such as research reactors or hot cells) and control, to the extent possible, the knowhow about how to produce and process either HEU (enrichment technology) or plutonium. This proliferation concern has led, over the last half century, to an elaborate set of international institutions and agreements, none of which have proved entirely satisfactory. The Nuclear Nonproliferation Treaty (NPT) is the foundation of the control regime, since it embodies the renunciation of nuclear weapons by all signatories except for the declared nuclear weapons states - the P-5 (the United States, Russia, the United Kingdom, France, China) - and a commitment to collaborate on developing peaceful uses of nuclear energy. However, non-signatories India and Pakistan tested nuclear weapons in 1998, and signatories, such as South Africa and North Korea, have admitted to making nuclear weapons. The International Atomic Energy Agency (IAEA) has responsibility for verifying NPT compliance with respect to fuel cycle facilities through its negotiated safeguards agreements with NPT signatories. The IAEA's safeguard efforts, however, are seriously constrained by the scope of their authorities (as evidenced in Iraq, Iran, and North Korea during the last decade), by their allocation of resources, and by the growing divergence between responsibilities and funding. The United Nations Security Council has not yet established a procedure or shown a willingness to impose sanctions when IAEA safeguards agreements are violated. A variety of multilateral agreements, such as the Nuclear Supplier Group guidelines for export control, aim to restrict the spread of proliferation-enabling nuclear and dual-use technology. European centrifuge enrichment technology, however, is known to have contributed to weapons development elsewhere, and the US and Russia have a continuing dispute over transfer of Russian fuel cycle technologies to Iran (a NPT signatory). This is not to say that the safeguards regime has failed to restrain the spread of nuclear weapons; it almost certainly has. Nevertheless, its shortcomings raise significant questions about the wisdom of a global growth scenario that envisions a major increase in the scale and geographical distribution of nuclear power. In addition to the risk of nuclear weapons capability spreading to other nations, the threat of acquisition of a crude nuclear explosive by a sub-national group has arisen in the aftermath of the September 11, 2001 terrorist attacks. The report of interest in nuclear devices by the terrorist Al Qaeda network especially highlights this risk. Terrorist or organized crime groups are not expected to be able to produce nuclear weapons material themselves; the concern is their direct acquisition of nuclear materials by theft or through a state sponsor. This places the spotlight on the PU REX/M OX fuel cycle as currently practiced in several countries, since the fuel cycle produces during conventional operation nuclear material that is easily made usable for a weapon. The sub-national theft risk would be exacerbated by the spread of the PUREX/MOX fuel cycle, particularly to those countries without the infrastructure for assuring stringent control and accountability. A separate concern is the dirty bomb threat in which radioactive material (from any source, such as nuclear spent fuel or cobalt sources used in medicine and industry) is dispersed in a conventional explosive as a weapon of mass disruption. The dirty bomb threat is a very serious security concern but is not specific to the nuclear fuel cycle and will not be discussed further in the proliferation context. It is useful to set a scale for the proliferation risk that has emerged from nuclear power operation to date. Spent fuel discharged from power reactors worldwide contains well over 1000 tonnes of plutonium. While the plutonium is protected by the intense radioactivity of the spent fuel, the PU REX chemical process most commonly used to separate the plutonium with high purity, is well known and described in the open literature. With modest nuclear infrastructure, any nation could carry out the separation at the scale needed to acquire material for several weapons. Further, the M OX fuel cycle has led to an accumulation of about 200 tonnes of separated plutonium in several European countries, Russia and Japan. This is equivalent to 25,000 weapons using the IAEA definition of 8 kg/weapon. Separated plutonium is especially attractive for theft or diversion and is fairly easily convertible to weapons use, including by those sub-national groups that have significant technical and financial resources. The nonproliferation issues arising from the global growth scenario are brought into sharp focus by examining a plausible scenario for the deployment of 1000 GWe nuclear capacity (see Table 3.2 and Appendix 2). An important char- acteristic of this scenario is that much of the deployment would be expected in industrialized countries that either already have nuclear weapons, thus making materials security against theft the principal issue, or are viewed today as minimal proliferation risks. The concern about these nations' ability to provide security for nuclear material is especially elevated for Russia, whose economic difficulties have limited its effort to adopt strong material security measures; the concern applies to materials from both the weapons program and the fuel cycle, which have significant inventories of separated.

### [Insert Proliferation Extinction Impact]

## 2NC Prolif Link Extension

### Extend 1NC Deutch – integration of nuclear power in everyday life makes nuclear material more susceptible to theft, corrupt uses, or terrorists

### Nuclear power leads to proliferation

Miller 01 (Mavin Miller, Leader in the Security Studies Program and Department of Nuclear Engineering at MIT, April 9th, 2001, “Attempts to Reduce the Proliferation Risks of Nuclear Power: An Overview of What’s Old and What’s New.” <http://www.nci.org/conf/miller/>)

At the same time that Amory Lovins, was posing the question, Can we have nuclear power without proliferation? in his book, Soft Energy Paths, [1] a prominent nuclear scientist was wrestling with the same issue in a series of lectures on the energy problem delivered at the Technion in Israel. Commenting on opposition to nuclear power on the grounds that it would give both sub-national groups and nations access to weapons-useable materials, he argued that the sub-national threat could be handled by increased security, but added: [2] I wish I could be as optimistic and positive about the remaining objection: as nuclear reactors spread among nations their production will enable almost every country to acquire nuclear weapons. This statement, most unfortunately, is true. I believe that eventually nuclear proliferation is unavoidable unless we find better solutions to international problems than are now on the horizon. Edward Teller was neither the first nor the best-known nuclear scientist who was concerned that nuclear power would facilitate the acquisition of nuclear weapons. Similar sentiments were expressed by Enrico Fermi: It is not certain that the public will accept an energy source that produces vast amounts of radioactivity as well as fissile material that might be used by terrorists. [3] And there is the oft-quoted statement in the Acheson-Lilienthal Report of 1946 that stressed the inadequacy of international inspections to prevent proliferation: [4] There is no prospect of security against atomic warfare in a system of international agreements to outlaw such weapons controlled only by a system, which relies in inspections and similar police-like methods. The reasons supporting this conclusion are not merely technical, but primarily the insuperable political, social, and organizational problems involved in enforcing agreements between nations each free to develop atomic energy but only pledged not to use bombs. So long as intrinsically dangerous activities [i.e., production and use of weapons-useable materials such as plutonium and highly-enriched uranium] may be carried out by nations, rivalries are inevitable and fears are engendered that place so great a pressure upon a system of international enforcement by police methods that no degree of ingenuity or technical competence could possibly hope to cope with them. However, in the euphoria generated by Atoms for Peace, most people reassured themselves that the type of safeguards system that had been judged to be inadequate in the Acheson-Lilienthal Report could nevertheless minimize proliferation risks. Proliferation might be a problem down the road, but it was difficult to stand in the way of a technology that would make the deserts bloom and would be too cheap to meter. Developing as well as developed countries were eager to avail themselves of the benefits of this new energy source. Publicly, this meant peaceful use, i.e., power, desalination, and production of special isotopes for medicine and agriculture. So nuclear technology flowed out of countries like the US and the Soviet Union, and foreign students and scientists flowed in, eager to learn the tricks of the nuclear trade. However, it was clear that the some of the same technologies, materials, and manpower could be applied to making weapons, and that safeguards could not prevent their diversion to such use. The wake-up call on the linkage between the peaceful and military atom was the Indian test in 1974. Much has been written about the Indian nuclear program, [5] and others will address it here. So I confine myself here to the observation that Homi Bhabhas strong stance that India would never accept colonialism in the nuclear sphere, coupled with the eagerness of the nuclear suppliers to sell their wares, provided India with the opportunity to produce plutonium and then use it in a peaceful nuclear explosive. The ensuing efforts to minimize the risk that civilian nuclear activities could be used as a cover for a weapons program encompassed both national and international initiatives. Since the US was the key player in these efforts, I turn next to the reassessment of non-proliferation policy in the US that started at the end of the Ford administration and was vigorously pursued by the incoming Carter administration.

### Nuclear power increases chances of nuclear prolif

Thränert 09 (Oliver Thranert, July 2009, CSS, Analyses in Security Policy, “The New Appeal of Nuclear Energy and the Dangers of Proliferation”)

The peaceful use of nuclear energy is becoming more attractive. Access to such technology is guaranteed under the terms of the Nuclear Non-Proliferation Treaty (N PT) as long as the related projects are not misused for military purposes. In the past, however, states have repeatedly succeeded in initiating nuclear weapons projects under the guise of civilian nuclear energy programs. Furthermore, the spread of atomic energy increases the risk of nuclear terrorism. International efforts should aim at a clear distinction between peaceful and military use of nuclear power. The attractiveness of nuclear energy is on the rise -as is the danger of proliferation: An ever increasing number of countries are aiming to construct nuclear power plants. The member states of the NPT not only have a right to maintain peaceful nuclear projects; they are even asked to provide mutual support. However, in the past, civilian programs have repeatedly been used to disguise the advancement of military was particularly striking. Delhi purchased a heavy water reactor from Canada. Ottawa was unaware that it was to be used for the production of weapons-grade plutonium. In persuade the international community that Iraq's nuclear program, which was actually aimed at building a bomb, was a peaceful project. Today, Iran claims that its nuclear program is exclusively intended for peaceful purposes; but the International Atomic Energy Agency (IAEA), due to a number of outstanding issues that give rise to concern, is not a in a position to exclude the existence of a possible military dimension to Iran's nuclear program. Indeed, it is indisputable that nuclear energy programs entail proliferation dangers. As long as a country only operates nuclear reactors, these dangers may not be dramatic. But when uranium enrichment and nuclear reprocessing are added to the equation, the problems increase drastically. Both of these technologies are well suited for producing weapons grade fissile material. This is the main obstacle to be overcome by any country that wants to build nuclear bombs.

# EMP DA

## 1NC—EMP DA

### Nuclear propulsion explosions cause EMP

Nichols & Womble 9 (Matthew E. Nichols, Bachelor of Science in Applied Physics and Mathematics, P.C. Womble, Ph D. Department of Physics & Astronomy at Western Kentucky University “Analysis of Nuclear Detonations on Nuclear Impulse-Driven Spacecraft,” *The Journal of Undergraduate Research in Physics,* 2009, <http://www.wku.edu/~matthew.nichols/Orion%20rev%20PCW.doc> apanday)

When a nuclear explosion occurs, several types of radiation are released including gamma rays and neutrons. These two forms of radiation are highly penetrating and are capable of ionizing and destroying both electrical systems and human tissue. Semiconductor materials such as integrated circuits or microprocessors are especially susceptible to these forms of radiation as the lattice structure of these devices will be damaged and will fail over time. In principle, the only way to reduce or eliminate such radiation is to increase the distance between the target and the source or place dense materials between them as a form of radiation shielding. With the design of the Orion the distance cannot be reduced as the spacecraft is considered a rigid body that requires proximity to the source to maximize the impulse, and thus materials must be selected to best shield a human crew and semiconductor electronics between the blast and the craft. However, a nuclear detonation will ionize matter that is not initially consumed in the reaction. These resultant free electrons can produce an extraordinarily fluctuating magnetic field known as an electromagnetic pulse (EMP).[3] This, in turn, produces an intense electric field that can induce massive amounts of voltage within electrical conductors and can destroy any electrical circuit in its wake. Disabling communications, navigation or life support in space would certainly present severe complications to any mission. This effect is greatly amplified on Earth: the presence of Earth’s magnetic field seizes these free electrons and accelerates them along the magnetic field lines while Earth’s atmosphere presents more matter to be ionized and thus creates more free electrons. In deep space, however, the EMP from nuclear pulse propulsion would primarily be propagated by the material within the craft itself as there will be no atmospheric material present, nor will there be a large, external magnetic field.

### EMP brings long-term instability – crashes all civilian systems

Clay **Wilson**, **8** (Clay Wilson, specialist in Technology and National Security Foreign Affairs, Defense, and Trade Division, July 21, 2008, “High Altitude Electromagnetic Pulse (HEMP) and High Power Microwave (HPM) Devices: Threat Assessments,” *CRS Report for Congress.* <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA529982&Location=U2&doc=GetTRDoc.pdf> apanday)

Studies related to the effects of electromagnetic energy used as weapons have been published infrequently, or remain classified.23 Nevertheless, it is known that a powerful HEMP field as it radiates outward can interfere with radio frequency links and instantly produce damaging voltage and currents in electronic devices thousands of miles from the nuclear explosion. Effectiveness is increased if the electronic devices are connected to any other metal that could also act as an antenna. Because infrastructure computer systems are interconnected, a widespread HEMP effect could lead to possible long-term disruption of the power grid, fuel distribution, transportation systems, food and water supplies, and communications and equipment for hospitals and first responders, as well as military communications systems which utilize the civilian infrastructure. An HPM weapon has a shorter possible range than HEMP, but it can induce currents large enough to melt circuitry, or it can cause equipment to gradually fail over a period of minutes, days, or even weeks. In 2001, a U.S. Comanche helicopter, flying in New York while performing a radar test involving HPM weapons, generated a low-level energy pulse that reportedly disrupted for two weeks the global positioning systems (GPS) being used to land commercial aircraft at a nearby airport in Albany, New York.24 A HEMP attack directed against the Unites States continent might involve a one-megaton nuclear warhead, or a smaller one, using a burst several hundred miles above the mid-western states to affect computers on both coasts.25 However,creating a HEMP effect over an area 250 miles in diameter, an example size for a battlefield, might only require a rocket with a modest altitude and payload capability that could loft a relatively small nuclear device. If a medium or higher range missile with a nuclear payload were launched from the deck of a freighter at sea, the resulting HEMP could reportedly disable computers over a wide area of the coastal United States. The disruptive effects of both HEMP and HPM reportedly diminish with distance, and electronic equipment that is turned off is only less likely to be damaged.26 To produce maximum coverage for the HEMP effect, a nuclear device must explode very high in the atmosphere, too far away from the earth’s surface to cause injury or damage directly from heat or blast. Also, HEMP produced by the nuclear explosion is instantaneous — too brief to start current flowing within a human body — so there is no effect on people. However, microwave energy weapons (HPM) are smaller-scale, are delivered at a closer range to the intended target, and can sometimes be emitted for a long duration. These characteristics of HPM can sometimes cause a painful burning sensation or other injury to a person directly in the path of the focused power beam, or can even be fatal if a person is too close to the microwave emitter.27

### Blackouts would lead to chaos and no resources

**Mazzaocchi 10** (Sherry Mazzocchi, NY Daily News writer, October 28th, 2010, “Massive Solar Flare Storm Warnings for the Next Few Years”, <http://www.redicecreations.com/article.php?id=13045> apanday)

There would also likely be no immediate help from neighboring areas, and big cities such as New York would be hit especially hard "You couldn't evacuate," he said. "Where do you put 8 million people?"

A severe blackout would have rapidly deteriorating effects. Without electricity, there would be a loss of potable water and the ability to pump sewage. Perishable food and medication would be lost.

"There are one million type 1 diabetes sufferers in the U.S.," he said. "Health issues would emerge in just a matter of days."Telecommunications have a backup for about 72 hours before they degrade. Similarly, hospitals have about a week's worth of backup power. Nuclear reactors typically have a week of standby diesel fuel. Even if they shut down, they still require electricity to circulate cooling water through the reactor. "This could be a serious problem for 70 or so large reactors," Kappenman said.

"We obsess over oil," said Kappenman, "but electricity is twice as important."

### EMP recovery lasts long – makes the US vulnerable

Clay **Wilson**, **8** (Clay Wilson, specialist in Technology and National Security Foreign Affairs, Defense, and Trade Division, July 21, 2008, “High Altitude Electromagnetic Pulse (HEMP) and High Power Microwave (HPM) Devices: Threat Assessments,” *CRS Report for Congress.* <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA529982&Location=U2&doc=GetTRDoc.pdf> apanday)

In the worst case, according to the study, not only is the damage from EMP widespread, but the duration of disrepair lasts for years. In such cases, there are numerous complicating factors that could slow the recovery process. The quantity of replacement equipment needed to restore the economy may quickly exhaust readily available supplies and, in extreme cases, existing manufacturing capacity. In such cases, the availability of skilled labor to replace and restore key infrastructure elements may also be in extraordinarily short supply. High-altitude EMP would also affect much larger parts of the region than the immediate Baltimore-Washington-Richmond area, further complicating recovery efforts. It is unlikely that restoration would occur in an orderly, linear fashion. More likely, restoration efforts would start slowly and gather speed as basic infrastructure is gradually brought on line.

## 2NC Link

### Extend Nichols and Womble – nuclear explosions above atmosphere leads to EMP causing disruption and destruction of critical infrastructure

### Nuclear explosions cause EMP – the “blast” and “heave” damage infrastructure

Clay **Wilson**, **8** (Clay Wilson, specialist in Technology and National Security Foreign Affairs, Defense, and Trade Division, July 21, 2008, “High Altitude Electromagnetic Pulse (HEMP) and High Power Microwave (HPM) Devices: Threat Assessments,” *CRS Report for Congress.* <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA529982&Location=U2&doc=GetTRDoc.pdf> apanday)

HEMP is produced when a nuclear weapon is detonated high above the Earth’s surface, creating gamma-radiation that interacts with the atmosphere to create an instantaneous intense electromagnetic energy field that is harmless to people as it radiates outward, but which can overload computer circuitry with effects similar to, but causing damage much more swiftly than, a lightning strike.16 The effects of HEMP became fully known to the United States in 1962 during a high-altitude nuclear test (code named “Starfish Prime”) over the Pacific Ocean, when radio stations and electronic equipment were disrupted 800 miles away throughout parts of Hawaii. The HEMP effect can span thousands of miles, depending on the altitude and the design and power of the nuclear burst (a single device detonated at an appropriate altitude over Kansas reportedly could affect all of the continental United States)17, and can be picked up by metallic conductors such as wires, or overhead power lines, acting as antennas that conduct the energy shockwave into the electronic systems of cars, airplanes, or communications equipment. A high altitude nuclear explosion (that creates HEMP) produces three major energy components that arrive in sequence, and which have measurably different effects that can be cumulatively damaging to electronic equipment. The first energy component is the initial energy shockwave, which lasts up to 1 microsecond, and is similar to extremely intense static electricity that can overload circuitry for every electronic device that is within line of sight of the burst. A secondary energy component then arrives, which has characteristics that are similar to a lightning strike. By itself, this second energy component might not be an issue for some critical infrastructure equipment, if anti-lightning protective measures are already in place. However, the rise time of the first component is so rapid and intense that it can destroy many protective measures, allowing the second component to further disrupt the electronic equipment. The third energy component is a longer-lasting magnetohydrodynamic (MHD) signal, about 1 microsecond up to many seconds in duration. This late time pulse, or geomagnetic signal, causes an effect that is damaging primarily to long-lines electronic equipment. There are two components to this third late time energy pulse, which experts call “blast” and “heave.” The “blast” results from a distortion of the earth’s magnetic field lines by the expanding, fully conductive fireball. The “heave” comes from the heating and ionization of a patch of atmosphere directly below the bomb that rises and, being conductive, also distorts the earth’s magnetic field. Both of these are considered MHD signals and are termed “slow” because they depend on the dynamics of cloud or fireball expansion. As the fireball expands, a localized magnetic effect builds up on the ground throughout the length of long transmission lines and then quickly collapses, producing the MHD “late-time” power surge, which can overload equipment connected to the power grid and telecommunications infrastructure. This late-time effect can add to the initial HEMP effect, and systems connected to long-lines power and communications systems may be further disrupted by the combined effects. Smaller isolated systems do not collect so much of this third energy component, and are usually disrupted only by the first energy component of HEMP.18 It is also important to note that this third, late-time pulse depends on the total energy of the nuclear detonation and therefore is usually associated only with larger yield nuclear weapons. However, the first energy pulse is a saturation-limited effect and is produced by all nuclear weapons, both small and large yield.

### Nuclear explosions lead to large scale EMP

Clay **Wilson**, **8** (Clay Wilson, specialist in Technology and National Security Foreign Affairs, Defense, and Trade Division, July 21, 2008, “High Altitude Electromagnetic Pulse (HEMP) and High Power Microwave (HPM) Devices: Threat Assessments,” *CRS Report for Congress.* <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA529982&Location=U2&doc=GetTRDoc.pdf> apanday)

Electromagnetic Pulse (EMP) is an instantaneous, intense energy field that can overload or disrupt at a distance numerous electrical systems and high technology microcircuits, which are especially sensitive to power surges. A large scale EMP effect can be produced by a single nuclear explosion detonated high in the atmosphere. This method is referred to as High-Altitude EMP (HEMP). A similar, smaller-scale EMP effect can be created using non-nuclear devices with powerful batteries or reactive chemicals. This method is called High Power Microwave (HPM). Several nations, including reported sponsors of terrorism, may currently have a capability to use EMP as a weapon for cyber warfare or cyber terrorism to disrupt communications and other parts of the U.S. critical infrastructure. Also, some equipment and weapons used by the U.S. military may be vulnerable to the effects of EMP. The threat of an EMP attack against the United States is hard to assess, but some observers indicate that it is growing along with worldwide access to newer technologies and the proliferation of nuclear weapons. In the past, the threat of mutually assured destruction provided a lasting deterrent against the exchange of multiple high-yield nuclear warheads. However, now even a single, low-yield nuclear explosion high above the United States, or over a battlefield, can produce a large-scale EMP effect that could result in a widespread loss of electronics, but no direct fatalities, and may not necessarily evoke a large nuclear retaliatory strike by the U.S. military. This, coupled with published articles discussing the vulnerability of U.S. critical infrastructure control systems, and some U.S. military battlefield systems to the effects of EMP, may create a new incentive for other countries to rapidly develop or acquire a nuclear capability.

### Nuclear explosions produce EMP

Clay **Wilson**, **8** (Clay Wilson, specialist in Technology and National Security Foreign Affairs, Defense, and Trade Division, July 21, 2008, “High Altitude Electromagnetic Pulse (HEMP) and High Power Microwave (HPM) Devices: Threat Assessments,” *CRS Report for Congress.* <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA529982&Location=U2&doc=GetTRDoc.pdf> apanday)

Commission members have stated at hearings that, as time passes without a visible effort to show the world that we are protecting our computer systems and critical infrastructures, the perceived inaction may actually invite a possible EMP attack.15 In the past, the threat of mutually assured destruction provided a lasting deterrent against the exchange of multiple high-yield nuclear warheads. However, a single, low-yield nuclear explosion high above the United States, or over a battlefield, can produce a large-scale, high-altitude EMP effect resulting in widespread loss of electronics, but possibly without direct fatalities. Therefore, an EMP attack directed against the United States involving no violent destruction, nor instant death for large numbers of U.S. citizens, may not necessarily evoke massive nuclear retaliation by the U.S. military, where, for example, large numbers of innocent civilians of a nation with a rogue leader might be killed. Such a perceived lower risk of assured destruction by the United States, and widespread knowledge about the vulnerability of U.S. civilian and military computers to the effects of an EMP attack, could actually create a new incentive for other countries or terrorist groups to develop, or perhaps purchase, a nuclear capability.

## 2NC Military Satellite Module

### EMP effect hurts satellite communication

Clay **Wilson**, **8** (Clay Wilson, specialist in Technology and National Security Foreign Affairs, Defense, and Trade Division, July 21, 2008, “High Altitude Electromagnetic Pulse (HEMP) and High Power Microwave (HPM) Devices: Threat Assessments,” *CRS Report for Congress.* <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA529982&Location=U2&doc=GetTRDoc.pdf> apanday)

A large percentage of U.S. military communications during Operation Iraqi Freedom was reportedly carried over commercial satellites, and much military administrative information is currently routed through equipment that comprises the civilian Internet.55 Many commercial communications satellites, particularly those in low earth orbit, reportedly may degrade or cease to function shortly after a high altitude nuclear explosion.56 Many commercial satellite control stations on the ground may also degrade after an EMP attack. However, some observers believe that possible HEMP and HPM vulnerabilities of military information systems are outweighed by the benefits gained through access to innovative technology and increased communications flexibility that come from using state-of-the-art electronics and from maintaining connections to the civilian Internet and satellite systems.

### Satellites are essential in the military.

**The Economist, 10** (“The problem of space pollution: Junk Science” 8/16/10, <http://www.economist.com/node/16843825>)

On the face of things, all this consideration of the problem is good. But this being space, where matters military are never far from the minds of those who think about it, there remains a serious question. Satellites are crucial to modern warfare. They spy on battlefields and on even the peaceful activities of enemies, rivals and questionable allies. They provide communication links. Knocking them out—as the Chinese practised with Fengyun-1C—would be a useful military trick. Any programme designed to remove satellites from orbit thus makes military types from other countries nervous. Some people, Mr Weeden among them, argue that such fears can be overcome if there is international co-operation over exactly which objects are removed and who is doing what. It would certainly be in everyone’s interest to do so.

### Destruction of communication causes pre-emption.

**Tellis, 07** (Ashley Tellis, senior associate at the Carnegie Endowment for International Peace, Fall 2007, “China’s Military Space Strategy”)

Finally, the growing Chinese capability for space warfare implies that a future conflict in the Taiwan Strait would entail serious deterrence and crisis insta-bilities. If such a clash were to compel Beijing to attack US space systems at the beginning of a war, the very prospect of such a ‘space Pearl Harbor’94 could, in turn, provoke the United States to contemplate pre-emptive attacks or horizon-tal escalation on the Chinese mainland. Such outcomes would be particularly likely in a conflict in the next decade, before Washington has the opportunity to invest fully in redundant space capabilities. Already, US Strategic Command officials have publicly signalled that conventionally armed Trident subma- rine-launched ballistic missiles would be appropriate weapons for executing the prompt strikes that might become necessary in such a contingency.95 Such attacks, even if employing only conventional warheads, on space launch sites, sensor nodes and command and control installations on the Chinese mainland could well be perceived as a precursor to an all-out war. It would be dificult for all sides to limit the intensification of such a conflict, even without the added complications of accidents and further misperception.96 The emergence of potent Chinese counterspace capabilities makes US military operations in Asia more risky than ever. The threat has not arisen due to a lack of a space arms-control regime, or because of the Bush administration’s disincli- nation to negotiate an accord that bans the weaponisation of space. Rather, it is rooted entirely in China’s requirement that it be able to defeat the United States in a regional conflict despite its conventional inferiority. This strategic chal- lenge has compelled Beijing to exploit every anti-access and battlespace-denial technology potentially available. The threat posed by this Chinese effort cannot be neutralised by arms-control agreements, even though all countries stand to profit from the absence of threats to their assets in space. There is a temptation, especially in the United States, to view China’s counterspace programmes in moralistic terms. This approach is undesirable and best avoided: Beijing’s desire to defeat the stronger by asymmetric means is not a reflection of its deviousness, nor provoked by mendacity on the part of the United States or the Bush admin- istration. It is grounded in the objective conditions that define the relationship between the two countries: competing political goals, likely to persist whether or not the Taiwan conflict is resolved. In such circumstances, the United States should seek, as the Bush administration’s own National Space Policy declares, to protect the ’use of outer space by all nations for peaceful purposes and for the benefit of all humanity’. But if this fundamental goal is threatened by Chinese counterspace activities aimed at American space assets, the United States has no choice but to run an offence–defence arms race, and win.

## Uniqueness – US Unshielded

### Vulnerable tech makes the US target to EMP

Clay **Wilson**, **8** (Clay Wilson, specialist in Technology and National Security Foreign Affairs, Defense, and Trade Division, July 21, 2008, “High Altitude Electromagnetic Pulse (HEMP) and High Power Microwave (HPM) Devices: Threat Assessments,” *CRS Report for Congress.* <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA529982&Location=U2&doc=GetTRDoc.pdf> apanday)

The 2008 EMP Commission report discussed vulnerabilities and interdependencies among U.S. critical infrastructures. Findings showed that only limited EMP vulnerability testing had previously been done for modern electronic systems that help support these infrastructures. In addition, the Commission expressed concern that widespread use of automated supervisory and control data acquisition (SCADA) systems for the critical infrastructure had allowed companies and agencies to systematically reduce the size of their work forces having the necessary technical knowledge needed to support manual operations of these infrastructure control systems, as might be needed during a prolonged emergency. The Commission concluded, after reviewing national capabilities to manage the effects of nuclear weapons (and EMP) on modern systems, that “the Country is rapidly losing the technical competence in this area that it needs in the Government, National Laboratories, and Industrial Community.”9

### US is unprepared for EMP effects

Clay **Wilson**, **8** (Clay Wilson, specialist in Technology and National Security Foreign Affairs, Defense, and Trade Division, July 21, 2008, “High Altitude Electromagnetic Pulse (HEMP) and High Power Microwave (HPM) Devices: Threat Assessments,” *CRS Report for Congress.* <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA529982&Location=U2&doc=GetTRDoc.pdf> apanday)

Experts on the Commission have asserted that little has been done by the private sector to protect against the threat from electromagnetic pulse, and that commercial electronic systems in the United States could be severely damaged by EMP attack.10 Commercial electronic surge arresters commonly used for lightning strikes reportedly cannot be relied on because most do not clamp fast enough to protect against the near-instantaneous effects of EMP (see section below on “Electromagnetic Pulse Overview”).11 In March 2007, a survey of state Adjutants General who oversee National Guard units throughout the country found that most state-based emergency responders are not actively preparing against an attack on the United States by electromagnetic pulse. The survey, entitled “Missile Defense and the Role of the States”, was conducted jointly by the Anchorage-based Institute of the North and the Claremont Institute of Claremont, California. Survey questions were sent to Adjutants General of all 50 states, with more than half responding. Although 96% of state Adjutants General indicated significant concern over an EMP attack, the majority had done little or no analysis of the effects of an overhead EMP attack, and little or no training, or preparation to harden electronic equipment. None of the Adjutants General surveyed indicated that they were actively involved in a formal planning process for response to an EMP attack.12

## Uniqueness - Military not ready

### DOD unprepared against EMP

Clay **Wilson**, **8** (Clay Wilson, specialist in Technology and National Security Foreign Affairs, Defense, and Trade Division, July 21, 2008, “High Altitude Electromagnetic Pulse (HEMP) and High Power Microwave (HPM) Devices: Threat Assessments,” *CRS Report for Congress.* <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA529982&Location=U2&doc=GetTRDoc.pdf> apanday)

In 2004, the EMP Commission held the collective the opinion that DOD had not engaged in any tabletop exercises and simulations that anticipate and EMP attack. In fact, an EMP commissioner observed that over the past 40 years, DOD has tended to “not introduce EMP attack into exercise scenarios or game scenarios because it tends to end the game, and that is not a good sign.”38

### Military assets are endangered by EMP

Clay **Wilson**, **8** (Clay Wilson, specialist in Technology and National Security Foreign Affairs, Defense, and Trade Division, July 21, 2008, “High Altitude Electromagnetic Pulse (HEMP) and High Power Microwave (HPM) Devices: Threat Assessments,” *CRS Report for Congress.* <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA529982&Location=U2&doc=GetTRDoc.pdf> apanday)

In April, 2005, the Defense Science Board (DSB) Task Force on Nuclear Weapon Effects (NWE) Test, Evaluation and Simulation published a report for DOD describing current and emerging threat environments. This included a comprehensive evaluation of future DOD capabilities for successful operation in nuclear environments. The DSB findings were independent, “but are highly consistent with, the findings and recommendations of the Congressionally mandated Electromagnetic Pulse (EMP) Commission.” The DSB findings include the following: Despite the reduction of the threat of strategic nuclear exchange, it is becoming more, not less, likely that U.S. forces will have to operate in a nuclear environment in regional operations. This is driven by the proliferation of nuclear weapon capabilities and the attractiveness of nuclear weapons as an offset to U.S. conventional superiority and as a counter to U.S. preemptive doctrine. ... factors that should make decision makers concerned about the survivability of critical warfighting elements in a nuclear environment. These include the shift to commercial-off-the-shelf (COTS) based electronics, aging of key systems, the growing reliance on historically “soft” C4ISR2 assets, the general neglect of nuclear hardening as a requirement, and the general neglect of nuclear environments as a factor in gaming and exercises. The bottom line is that commanders and planners cannot be assured that today’s weapons platforms, command and control (C2), intelligence, surveillance and reconnaissance (ISR), and associated support systems will be available should a nuclear detonation occur.39

## A2: Testing

### Testing on EMP was inaccurate – recovery would be long-term

Clay **Wilson**, **8** (Clay Wilson, specialist in Technology and National Security Foreign Affairs, Defense, and Trade Division, July 21, 2008, “High Altitude Electromagnetic Pulse (HEMP) and High Power Microwave (HPM) Devices: Threat Assessments,” *CRS Report for Congress.* <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA529982&Location=U2&doc=GetTRDoc.pdf> apanday)

However, other analysts maintain that some past testing done by the U.S. military may have been flawed, or incomplete, leading to faulty conclusions about the level of resistance of commercial equipment to the effects of EMP. These analysts also point out that EMP technology has been explored by several other nations, and as circuitry becomes more miniaturized, modern electronics become increasingly vulnerable to disruption. They argue that, depending on the targeted area and power of an EMP attack, it could possibly take years for the United States to recover fully from the resulting widespread damage to electronics and the power grid.14

# Resource War Turn

## 1NC—Resource War Turn

### Mining for H3 leads to extinction – resources wars and international conflict

**Lasker 10** (John Lasker, an investigative journalist for Wired, CSM, and Space News, Published: April 30th, 2010, *TECHNOIR: 13 Investigations from the Darkside of Technology, the US Military and UFOs*)

Back in 1998, representatives from Halliburton and Shell met with officials from NASA to talk, practically in secret. At Los Alamos, NM, no less, home to some of the most radical and exotic US military research ever. They met over the prospects of drilling on Mars and the Moon. From that meeting, Halliburton – the oilfields technology and services corporation once ran by Dick Chaney – came away with the idea of building a drill specifically for our two closest celestial bodies.

Why build a drill for the Red Planet and the Harvest Moon? And why “No-bid” Halliburton? Which still has a strong connection to one of its greatest beneficiary's, Dick Chaney, of course. Yes, that US Vice President, the one who tricked the world into thinking the US needed to invade Iraq for Weapons of Mass Destruction.

Bruce Gagnon, the space weapons expert who runs The Global Network Against Weapons and Nuclear Power in Space, asks a rhetorical question: “Why do you think Halliburton is building a drill for Mars and the Moon?” To monopolize the untold resources Mars and the Moon might offer? The question nearly answers itself, says Gagnon. “There’s going to be a scramble for the moon by the Chinese, the Russians and the Americans. This is real. There’s going to be a conflict over it,” he says. “Who controls the moon is going to be rich by unimaginable amounts.”

Perhaps those cards are in the future for mankind. But certainly mankind has history on its side as a warning. History in the form of an Iraqi insurgency. The Iraq insurgency erupted, in part, over Dick Chaney and his neo-con’s plans to privatize all of Iraq’s industries, including oil, which would be taken over by American oil giants such as Shell and Exxon. And while some may think that thousands of US troops and Iraqi civilians died in vain due to the Iraqi insurgency, perhaps their souls won't allow Chaney’s legacy and his offspring to trick us again. Hopefully on this planet and beyond.

This doesn’t mean, however, there won’t be a future when man goes to war on the very surface and within the orbits of Mars and the Moon so to control the resources that can be mined and flown back to Earth. In fact, man has already predicted such a conflict will take place. In 1995, in a New York Times op-ed written by science writer Lawrence Joseph, he asks the question, “Will the Moon become the Persian Gulf of the 21st Century? And if the US does not take action in regards to the Moon, the nation could slip behind in the race for control of the global economy, and our destiny beyond.”

Coincidently, late in 2009, a US Air Force recruiting commercial claiming their technology isn't “science fiction”, shows US troops tactically moving across a red and barren landscape that looks too much like Mars.

**Resource wars will either end when the human race becomes extinct, or rage on forever and ever as humans migrate across the universe.** A migration Carl Sagan predicted will undoubtedly occur because of man’s unwaivering desire to survive, he theorized. But Sagan also conceded that our collective stupidity might do us in before we even migrate off the planet. The irony is, **it might just be a resource war that ends the human race.**

Futurists and economists predict many nations, many years from now, will wage war for fresh water. It is almost inevitable if Global Warming and the Earth’s increasing population both continue to hurdle toward unsustainable proportions, they contend. In our time, the resource mankind has shed so much blood for is oil. When the Spanish and Aztecs battled in the 1520s, it was for gold and land. In America 1860s, the Civil War was fought over free labor. In the heart of Africa 1990s, a war was waged for coltan, a black metal needed to satiate the West's craving for personal electronics.

How about about 100 years from now? When oil, natural gas and coal are ancient history. When wind and solar power are unable to support billions of people. What will mankind be fighting over then? A super-fuel from the stars? If you know anything about being human, and about greed and power, it’s possible.

The answer to what resource man will be tragically dieing for long after current generations are gone, might lie in the current race for the Moon. A race many people aren't aware even started. But at the moment, nearly a dozen nations and corporations are planning to invade our nearest celestial neighbor – either with humans or robots – an invasion that could take twenty years or longer. And if mankind does make it back, we may potentially stay for years to come, and possibly as long as the Earth is around.

A rediscovery that could literally shatter the Moon

In 1985, a small team of fusion researchers from the University of Wisconsin made a “rediscovery” so potentially momentous it might someday literally shatter the surface of the Moon. The holidays were nearing, and the UW fusion research team was brainstorming: They wondered where they could find large quantities of Helium-3, or He3, an isotope of ordinary helium. Helium-3 is a proven fuel for nuclear fusion when you add Helium-3 to deuterium at a high temperature. One kg of Helium-3 burned with 67 kg of deuterium gives us nearly 20 megawatt-years of energy. Just two hundred pounds, they figured, could power a city of one million inhabitants for one year. Their calculation was based on dozens of incredibly small-scale fusion reactions they had carried out in a basketball-sized fusion device. Proving proof of principle, but at an extremely small rate.

“It was around Christmas. That's when we made what I like to call our rediscovery,” said Dr. Gerald Kulcinski, part of the UW team since the beginning and now the director of the Fusion Technology Institute at UW. Apollo astronauts, they remembered, had found quantities of Helium-3 on the moon, Kulcinski said. So they sought out NASA and inquired about their lunar soil samples.

“Apollo records showed that every sample of lunar material had Helium-3 in it,” Kulcinski said. Now, nestled among NASA's 200-point mission goals for lunar base plans is a proposal to mine the moon for this fuel. Even though so far there are no viable power plants that exist for it or efficient ways to bring it back to Earth.

Nevertheless, UW fusion researchers believe their plan could get civilization off fossil fuels. That’s if large crews and heavy equipment could go to the Moon to mine for Helium-3, super-heat it out of a lunar ore called ilmenite, process the gas, and return it to the Earth. Also, this incredible plan depends on whether large numbers of commercial fusion reactors could be built.

Their theory initially didn't shear off the tops of Moon mountains. But scientists and investors have taken notice. Now, China, India, the European Space Agency and Russia are also planning on a manned lunar base. There is increasing talk of a race to control this fuel, of which one Space Shuttle load could theoretically power the United States for a year.

# Solvency

## Tech Hurdles

### Too many engineering hurdles to successfully initiate nuclear pulse propulsion

**Cassenti & Kammash 8** (Brice Cassenti, Department, of Engineering & Science at Rensselaer Polytechnic Institute & Terry Kammash, Nuclear Engineering Department at University of Michigan, “Engineering Challenges in Antiproton Triggered Fusion Propulsion” 2008, Volume 969, pp. 503-510, <http://link.aip.org/link/?APCPCS/969/503/1> apanday)

Nuclear pulse propulsion holds the promise of high specific impulse with high thrust, but there are formidable engineering obstacles that must be overcome before it can become a reality. Pulse nuclear propulsion based on critical mass devices cannot satisfy the ban on nuclear weapons n space. Using nuclear weapons technology smaller devices that do not contain a critical mass of fissionable material can certainly be developed. Inertial confinement fusion using lasers or relativistic ion, or electron, beams for compression is one approach that does not depend on nuclear weapons technology, but the technology is complex and requires extremely accurate compression. A more important fact is that the inertial compression system would dominate the mass of an inertial propulsion system. Magnetically insulated inertial confinement fusion (MICF) is an approach that could generate extremely high transient magnetic fields and these fields could be used to help to contain the fusion plasma. The lasers would require large power supplies and hence would add a significant mass to he propulsion system, although it would be less than the mass requirements for an inertial confinement system. The mass of the lasers could be removed if antiprotons were used to lignite a fusion reaction. The storage and delivery system would clearly be less massive than either MICF or inertial confinement systems. The annihilation energy can be effectively used if the antiproton is annihilated on a fissionable nucleus (e.g., uranium). The fission fragments could then be used to heat the fusion fuel. The problem here is the propagation of the fusion reaction through the pellet. It must last long enough for at least five percent of the fuel to fuse. This is the key question that must be answered. A second question is the size of the focal spot that will result from the injected antiprotons, which must remain small for sufficiently strong magnetic fields to be generated. It may be possible to precisely tune the antiproton energy to a transmission resonance so that the antiprotons annihilate precisely at a predetermined spot. Research needs to be performed to determine the transmission spectra of the pellet constituents to antiprotons for various injection energies for this technique to be used effectively. Finally there is the problem of neutron radiation damage. Shielding based on ablation may not be effective. Here there are two possible solutions: I) the neutrons could be used with lithium to generate the tritium or 2) the higher energy fusion generated neutrons could be used to split a fissionable nucleus and turned into lower energy neutrons that require a smaller shielding mass.

# Politics

## Plan Unpopular

### Nuclear option seen as dangerous, risky, and costly

Jeffery King, 5/12/11 (The Nuclear Option, Concordiensis, http://www.concordy.com/article/opinions/may-12-2011/the-nuclear-option/)

Dangerous, risky, costly, unpopular. These words describe our current perception of nuclear fission. In the wake of the Japanese earthquake and ensuing tsunami, the heavily damaged and melting reactors of the Fukushima Dia-ichi plant only underscore these sentiments as news of the crippled plant continues to report bleak information on a daily basis. The multifaceted catastrophe is expected to take more than a decade to clean and cost the island nation billions. Man certainly cannot tame Mother Nature’s fury, and the nuclear crisis is a result of underestimation and complacency. Nuclear planners did not anticipate the destructive capabilities of their low-lying placement of the plant in an active seismic zone. The blatant evidence is clear with the presence of six active reactors clustered at this one vulnerable site. In the U.S., no single plant operates more than three reactors in one location. Some prominent nuclear scientists from the International Atomic Energy Agency have even cited the design of the plant’s reactors (boiling water reactors) as being much less safe than the alternative pressurized water reactors more commonly used across the globe. How will these events affect the greater global demand for clean energy in the wake of a catastrophe that is considered biblical by many affected? In America, nuclear power has waned in the past quarter century, due to cheap energy costs provided by carbon-based fuels. Currently, carbon-based fuel prices have skyrocketed because of increased global demand and instability in supply (namely, unrest in oil-producing countries)—causing many to rethink nuclear power as a viable option. Current plants in America continue to approach the end of their intended life cycles. Back in his 2010 State of the Union Speech, President Obama announced that the expansion of nuclear energy across America would be an essential component of his green energy revolution. France receives a majority of its power from nuclear fission and sees the Fukushima disaster as an opportunity. A new design for a pressurized reactor by its industrial group AREVA shows great promise for the future of safer designs, which can be exported to the global market. In the U.S., only two new plants are under construction in addition to the existing 104. The most recent plant in this country was built in 1996. But throughout that time, America has continued to build reactors at a relatively brisk pace thanks, in part, to the military. Nuclear propulsion is essential to our Aircraft Carrier armada as well as our fleet of submersibles. In fact, the military is on its ninth generation of portable reactors with no reported history of a major incident. Long gone are the days of unpredictable experimentation on fissionable materials, as we have over a half a century’s worth of knowledge and experience with safe and reliable reactors. Japan’s current nuclear disaster is not one of total human error as was the case with Chernobyl’s meltdown 25 years ago, but it represents a failure of the Japanese governmental agency responsible for the due-diligence of nuclear safety. If the Obama administration is serious about implementing its green energy policy, nuclear power must be a sizable component. With savings generated by the replacement of fossil fuels with nuclear power, new capital can be utilized to invest in research and development of other renewable essential to our reduction of foreign dependency and green energy initiative. The U.S. should view the Japanese crisis as an opportunity to learn from and build upon. Taxation issues aside, energy costs could well determine the future of our ability to innovate and produce. However, will the events in Japan curtail these plans just like the BP oil spill of last year restricted deep sea drilling in the Gulf? The revival of the nuclear power debate will be a prominent global issue for decades to come and its future remains ambiguous at best.

### NASA funding unpopular – failed too many times.

Andrew Gasser, 4/6/11 (Russia Wants a Nuclear Rocket, http://www.teainspace.com/russia-wants-a-nuclear-rocket/)

Russia wants to build a nuclear rocket. Apparently they have the technology and a design. They just do not have the 600 million (Million with an M) dollars to build it which leads me to a question. We are the United States of America. We are supposed to DOMINATE in space. We have the biggest budget for developing space technologies, space exploration, and earth science with a budget of somewhere around 18 billion (Billion with a B) spent annually; so why cannot we do this? Why is the United States beginning to fall behind, not only in space, but in world stature and power? China, Russia, and India are all rapidly catching up to our prestige and power. The freedom and democracy the American left “cherish” is destroying us from the inside out. If you critically think about what makes US Spaceflight interesting right now, it certainly isn’t NASA but the debate in the aerospace industry about commercial space. There is a real battle going on to see who will get funding to build the next heavy lift vehicle (HLV). Some ask the question do we even need the HLV? Consider that NASA has spent 20 billion (Billion with a B) dollars on trying to develop new technologies and systems to get into orbit since 2000. What does NASA have to show for it? NASA has spent 500 million (Million with an M) dollars for SpaceX to develop new technologies and systems to get into orbit. What does SpaceX have to show for it? It is obvious to anyone who even pays casual attention to the space industry that the US federal government (NASA) has played a huge roll in commercial space’s success. But what can we learn here as concerned US citizens about fiscal responsibility and ownership? Look no further than Rocketplane Kistler (RpK). They were awarded money from NASA to develop a launch system. They failed, lost there contract, and the US Taxpayer was out 175 million (Million with an m) dollars. Now look at the Constellation project. NASA budgeted 11.1 billion (Billion with a B) dollars and they failed. People kept their jobs, some were promoted to key leadership positions in NASA, and it is business as usual. The NASA "Meatball" Why don’t our elected officials who were sent to congress to clean the mess up start with NASA? NASA is only .62 of one percent of the United States federal budget. If our officials cannot clean up NASA how will they fix enormous problems like Social Security? The incessant hand wringing by elected officials from BOTH sides of the isle are wasting money and even a more precious resource, time, debating the Space Launch System (SLS). NASA does not want it. The administrator does not want it. The president does not want it. Only congress wants it. Not only is SLS a waste of time but also a waste of money. And speaking of which, the “conservative right” is all about free enterprise and creating new markets, right? President Obama has only proposed using the free market once during his presidency: Commercial Space. Yet “conservative” elected officials went up in arms about our loss of the aerospace industry. This simply is not going to happen. We do not need NASA designing, building, and flying rockets. We need NASA designing, building, and flying missions. Elected officials like Senator Shelby of Alabama costs the US Taxpayer 1.6 million (Million with an m) dollars a day funding Constellation, the canceled rocket, with an amendment of legislation he inserted into the budget. How is that conservative? How is that fiscally responsible? Elected officials from both sides of the isle bring home the bacon under the guise of NASA. It is no surprise liberals like Congresswoman Fudge (D-OH) spent 5 minutes of her time in the most recent hearing on NASA Spaceflight questioning Doug Cooke on the wonders of Glenn Research Center and the Ares Ix “upper stage simulator”. She knows what NASA is, a government jobs program. She spends time “bringing home the bacon” for her district. But what about the people’s business of conducting spaceflight, human and robotic? NASA is building a legacy of wasting billions of dollars on wicked cool power points, cgi graphics, speeches, and test articles. SpaceX is building a Evolvable Expendable Launch Vehicle (EELV) in every sense of the term. From Falcon 1, to Falcon 9, to Falcon Heavy. SpaceX is evolving… …and Russia is serious about building a nuclear rocket. I want to make it clear that I do not support the president in anyway when it comes to health care, fiscal, or social issues. However, when he agrees with us we should embrace it.

### Japan made US weary of nuclear energy

Henry Blodget, 3/14/11 (Japan's Nuclear Meltdown Has Congress Questioning Nuclear Energy, http://finance.yahoo.com/tech-ticker/japan's-nuclear-meltdown-has-congress-questioning-nuclear-energy-536025.html?tickers=xle,xlu,xom,cop,pbw,bphttp://finance.yahoo.com/tech-ticker/japan's-nuclear-meltdown-has-congress-questioning-nuclear-energy-536025.html?tickers=xle,xlu,xom,cop,pbw,bp)

As the nuclear emergency in Japan unfolds, Congress has begun expressing caution about America's use of the technology going forward. Over the weekend, for example, Connecticut Senator Joe Lieberman said we should "put the brakes on" construction of any new nuclear energy plants in the US, until we understand what happened in Japan and what we can do to make the technology safer: "I've been a big supporter of nuclear power because it's domestic, it's ours and it's clean," Lieberman said on Face The Nation. "We've had a good safety with nuclear power plants here in the United States... I don't want to stop the building of nuclear power plants, but I think we've got to kind of quietly, quickly put the brakes on until we can absorb what has happened in Japan as a result of the earthquake and the tsunami and then see what more, if anything, we can demand of the new power plants that are coming online." Three Mile Island meltdown in Pennsylvania in 1979, effectively killed the nuclear industry in America. Dozens of plants under construction at the time have come on line, but not a single new facility has been commissioned since the disaster. Sentiment had been shifting back towards nuclear in recent years. The government has set aside $18 billion for new nuclear plants, and President Obama wants to spend an additional $36 billion. Now all that is in question. The emergency in Japan is still unfolding, so it's hard to draw any conclusions from it yet. At least one nuclear expert, Josef Oehmen of MIT, says that fears of a massive radiation accident are overblown. But this hasn't stopped perception that the situation is continuing to get worse. Whatever happens in Japan, there's no free lunch. As we saw vividly in the Gulf oil spill last year, conventional fuels come with their own risks and costs, so it's a question of which risks the country (and world) prefer to bear. Another thing that has unfortunately become clear is that, in the absence of an emergency, Americans are above all committed to keeping energy as cheap as possible, which has made establishing a long-term sustainable energy plan for the country politically difficult (if not impossible). Sources of safe, renewable energy are still considerably more expensive than fossil-fuels and nuclear power, and when there isn't a crisis front and center, short-term price concerns seem to carry the day. Perhaps memories of the oil spill, combined with the disaster in Japan, will begin to change that. But I'm not waiting on the edge of my seat.

Nuclear energy support waning in Congress – lobbyists desperate to win back support

Dana Bash, 3/14/11 (Nuclear energy lobbyists scramble on Capitol Hill, CNN Senior Congressional Correspondent, http://politicalticker.blogs.cnn.com/2011/03/14/nuclear-energy-lobbyists-scramble-on-capitol-hill/)

Washington (CNN) - Lobbyists for the nuclear energy industry rushed to Capitol Hill Monday to try to reassure members of Congress and their aides who are deeply concerned about the nuclear crisis in Japan, and what it could mean for nuclear energy in the U.S. As he walked the halls of Congress going from meeting to meeting, Alex Flint, a top lobbyist for the Nuclear Energy Institute, told CNN that the industry's immediate goal was to give worried lawmakers as much information as possible. "We're trying to make sure people understand exactly what's occurring - understand the context under which they're going to be making decisions in the future about the way in which the Congress wants to treat nuclear energy," Flint told CNN. Flint was careful not to sound like he was trying to pressure Congress at such a sensitive time, but there is no question he and other industry representatives are working to prevent support for nuclear power from unraveling on Capitol Hill. Flint's first afternoon stop was a meeting he helped arrange with Senate Energy and Commerce Chairman Jeff Bingaman, D-New Mexico, a supporter of nuclear energy, for aides to all senators and Senate committees. In a sign of the intense interest, some 150 Senate aides showed up for the briefing to hear from representatives of the Nuclear Energy Institute, the industry's lobbying arm, and Exelon, the Chicago-based owner of the largest group of U.S. nuclear power plants. Later, they repeated the same briefing for aides to the House Energy and Commerce Committee and the House Appropriations Committee. Bipartisan support for nuclear power has been growing in recent years, as lawmakers look for alternative energy sources. The crisis in Japan threatens to reverse strides the nuclear industry was making in getting financial and policy support from Congress for new nuclear power plants. During the closed-door question-and-answer session, industry representatives handed out an 11-page information packet, obtained by CNN, which was clearly designed to quell concerns. "Given the safety record in this country...we believe that public support for nuclear power should not decline dramatically," reads the industry prepared packet. Despite the push, already senators who have long championed nuclear energy in the United States were voicing concern. Sen. Joe Lieberman, I-Connecticut, told CNN he believes it’s best to "slow things down" with regard to the permitting process for new nuclear power plants in the United States, until more information is known about the situation in Japan. Sen. Lisa Murkowksi, R-Alaska, said she hopes nuclear energy in the U.S. is not in jeopardy, but isn’t so sure. "We're all watching the situation in Japan with a great deal of concern about what Mother Nature has wrought not only to the country of Japan but perhaps just how nuclear is viewed in the world," said Murkowksi, as she raced to her own meeting about the crisis. Flint is pushing hard to keep congressional supporters from turning their backs on nuclear power. "We have a lot of support from politicians in both parties right now. They all have questions - they've been watching the news," Flint told CNN, "whether they’re changing their mind, whether there are issues we need to address, this is a two way conversation." As Flint moved from congressional meeting to meeting, word came that top Democrats called for an investigation of the safety of U.S. nuclear power plants. Without missing a beat, Flint said that was to be expected, and insisted the industry would welcome a probe of safety. To be sure, Flint is getting help from powerful lawmakers who are not wavering. "I would hope leaders here would not try to take advantage on an opportunity to demagogue an issue and appeal to the worst, appeal to the fears in people," Sen. Jon Kyl, R-Arizona, told CNN. By the end of the day, Flint and other leading representatives of the nuclear industry had met with hundreds of people on Capitol Hill - mostly congressional aides. It helps that Flint used to be the staff director for the Senate Energy and Commerce Committee. He says that gives him a better understanding of how Congress works. It also gets his phone calls returned and gets him in the door, as he begins what he says will be a long process of convincing lawmakers not to give up on nuclear energy in the United States, as they and their constituents watch the horrific images coming from Japan.

### Taxpayers against nuclear energy

NIRS, 4/13/11 (Nuclear Information and Resource Service. Tell Congress: No more taxpayer $ for more nuclear power, http://org2.democracyinaction.org/o/5502/p/dia/action/public/?action\_KEY=5848)

The crisis at the Fukushima nuclear site in Japan continues, seemingly without end. The accident is now officially on the scale of Chernobyl. The "evacuation" zone has expanded, and in reality has become a permanent relocation zone. Radiation contamination has reached the food supply and seawater in the Pacific Ocean. We are posting updates regularly on our website: www.nirs.org. Please check often for new information. The lesson of this catastrophe is clear: we must end the use of nuclear power. And that must start with the prevention of any new nuclear reactors. It is outrageous that the Obama Administration continues to say nuclear power will be part of its "clean energy" strategy and continues to seek $36 Billion MORE in taxpayer loans for new reactor construction. This funding must be stopped, and existing taxpayer subsidies for the nuclear industry withdrawn. How anyone can view the images coming from Japan and continue to claim nuclear power is somehow "clean" is beyond our ability to comprehend. If ever there was a time for Congress to hear our voice, it is now. We're asking you--and everyone you know--to act now. More than 40,000 letters have gone in over the past month, but we have never needed a larger public outpouring and more outreach than right now. Please use the handy icons above to post this page on Facebook, Twitter and other networking sites and e-mail it to your lists, your friends, your colleagues.

### Exposed dangers tank support for nuclear energy

Jeff Donn, 6/24/11 (The Associated Press, Congress to look into aging nuclear power plants, http://www.daily-chronicle.com/2011/06/23/congress-to-look-into-aging-nuclear-power-plants/a4vyhz9/)

Three U.S. senators, alarmed by findings of an Associated Press investigation about aging problems at the nation’s nuclear power plants, asked Thursday for a congressional investigation of safety standards and federal oversight at the facilities. The request by Democrats Barbara Boxer of California and Sheldon Whitehouse of Rhode Island and independent Bernard Sanders of Vermont builds on increased public concern about nuclear safety in recent months – an outcry unlike anything since the Chernobyl nuclear accident in 1986. Public interest first spiked after the March accident at the Fukushima Dai-ichi nuclear plant in Japan. Concern has been heightened this week as the AP began releasing the results of a yearlong investigation into aging related safety problems at the 104 reactors operating in the United States. That’s led activists, politicians, critics and safety watchdogs to say they hope to turn the public focus more sharply onto the industry in America and broader regulatory problems at the U.S. Nuclear Regulatory Commission. One after another, they said they hope the result will be tougher relicensing and safety standards, safer storage of spent fuel and better disaster planning. Janet Tauro, of Brick, N.J., co-founder of Grandmothers, Mothers, and More for Energy Safety who lives near the Oyster Creek nuclear plant, said the latest developments have led her to conclude “the light is really starting to shine on a very closed regulatory agency.” Senators Boxer, Whitehouse and Sanders asked for the oversight investigation by the Government Accountability Office. Boxer chairs the Senate Committee on Environment and Public Works. New Jersey’s two Democratic senators, Frank R. Lautenberg and Robert Menendez, made a similar request of the GAO earlier this week. In recent months, public anxiety over nuclear power has “peaked incredibly,” said engineer Paul Blanch, an industry whistleblower who later returned to work on improving safety. He is now fighting relicensing applications at four sites. “I was fighting the world, and now I’m only fighting half the world,” Blanch said. Visits to the website of Fairewinds Associates, a nuclear safety consultant in Burlington, Vt., have exploded from about 80 a day to 7,000 since the Japanese accident, according to chief engineer, Arnie Gundersen. Site visits rose about another 10 percent when the AP series started Monday. The AP’s four-part investigative series shows that government and industry have been working in tandem to weaken safety standards to keep aging reactors within the rules. The series also found that there have been leaks of radioactive tritium, often from corroded underground piping, at three-quarters of U.S. commercial nuclear power sites. In a GAO report released Tuesday by Democratic Reps. Edward J. Markey of Massachusetts and Peter Welch of Vermont, the watchdog agency concluded that nuclear power plant operators haven’t figured out how to quickly find the underground leaks, which often go undetected for years. The AP series comes three months after a tsunami born from an earthquake caused a nuclear crisis at the Fukushima Dai-ichi nuclear complex in Japan. The March 11 natural disaster swamped backup generators, disabled cooling systems, caused fuel melts and explosions, and released vast amounts of radiation into the grounds and sea. The NRC has said it disagrees with AP’s conclusions, but welcomes the attention the stories have generated to nuclear plant safety. The agency defended its standards and approach to safety. The industry’s Nuclear Energy Institute criticized AP’s overall findings and “selective, misleading reporting” on U.S. nuclear power plant safety.

## Plan Popular

### Nuclear option has success in Congress

Hou Dan Wang Yixiao, 7/28/11 (Space may be approved by the U.S. Congress to restart nuclear program, http://www.cnkeyword.info/space-may-be-approved-by-the-u-s-congress-to-restart-nuclear-program/)

According to China’s national defense science and technology information network news, according to the United States today Aerospace Network July 25, 2011 reported that the Obama administration plans to resume production in the United States provide the impetus for future space missions the required nuclear material, the program has won initial success in the U.S. Congress. House Appropriations Committee has agreed in 2012 to provide $ 10 million for NASA funding, to re-start production of plutonium-238, the radioisotope for 2020 and beyond, inside and outside the planetary mission to provide power. according to plan, NASA will use the Department of Energy (DOE) facilities needed for the production of nuclear materials. House of Representatives rejected the application for DOE radioisotope production starts $ 10 million. DOE budget expenditure monitoring panel said, because DOE does not receive direct benefits, NASA should pay all the costs. plutonium-238 over the years has provided the impetus for NASA space missions, the United States ended in 1988 in South Carolina DOE’s Savannah River Site to produce plutonium-238, but retained a bill of materials, plutonium-238 purchased from Russia to add the stock. 2009 expiry of the agreement year with Russia, so in June 2010, the administration submitted to Congress a plan, including the use of DOE in Iowa and Tennessee National Laboratory Room (re-production of plutonium-238). Department of Energy fiscal year 2010 to apply the $ 30 million by legislators shot, after a Senate panel has rejected the Department of Energy fiscal year 2011 to apply for the $ 15 million. NASA made a similar application had never been in the House vote. but in July 2011, control of the budget NASA has decided to support the House panel to restart production of plutonium-238, the group main (Frank Wolf) vowed to do everything we can to promote the plan approved. At the same time, legislators also encourages NASA to continue with the DOE to improve its radioisotope propulsion system, especially the “advanced Stirling (Stirling) Radioisotope generators” of cooperation, which will enable NASA to better, more effective use of plutonium-238 materials. DOE estimates need to restart the plutonium-238 production cost of 75 million -9000 ten thousand U.S. dollars, 5-6 years after the production of new plutonium-238, planned average annual production of 1.5 kg. task requires not only the outer planets to rely on radioactive energy sources to power, within the solar system to visit the moon and Mars and other shady side need. Including the American Astronomical Society (AAS), American Institute of Physics, American Geophysical Union, American Physical Society, including the scientific community has been lobbying the legislature on the matter, they will vote the House of Representatives as significant progress.

### Nuclear option popular with the House

Yasmin Ogale, 7/21/11 (Using Nuclear Fuel for Future NASA Missions Gets Boost, <http://news.sciencemag.org> /scienceinsider/2011/07/using-nuclear-fuel-for-future.html)

The Obama Administration's plan to resume domestic production of the nuclear material needed to power future space missions has won its first, partial victory in Congress. Last week, the Appropriations Committee of the House of Representatives voted to give NASA $10 million next year to restart production of plutonium-238, a radioisotope whose heat is converted to electricity to power inner and outer planetary missions in the 2020s and beyond. It's a belated endorsement of a plan that would use Department of Energy (DOE) facilities to produce the material that NASA needs. However, also last week, in a separate vote, the full House rejected the other half of the strategy—DOE's request for $10 million to begin the work needed to generate the radioisotope. The spending panel overseeing DOE's budget said that NASA should pay the full cost since DOE derives no direct benefit. Pu-238 is produced by irradiating neptunium-237 in a nuclear reactor, and over the years it has powered 26 NASA space missions. The United States stopped production in 1988 at DOE's Savannah River site in South Carolina, but maintained an inventory of the material that was supplemented by purchases from Russia. Russia ended that arrangement in 2009, however, and in June 2010 the Obama Administration outlined a plan to Congress that involved using DOE's National Laboratories in Idaho and Oak Ridge, Tennessee. DOE's request for $30 million in the 2010 fiscal year was shot down by legislators, and last year a Senate panel rejected DOE's request for $15 million in FY2011. A similar request from NASA was never put to a vote in the House. But this month, the House panel that controls NASA's budget embraced the idea. And its chair, Representative Frank Wolf (R-VA), has vowed to fight any attempt to remove the money from NASA's 2012 budget as it moves through Congress. "It is something that Mr. Wolf is going to defend," says a Republican legislative aide. "If there is an effort to try to take it out, Mr. Wolf is going to try to defend it." The aide characterized its chances of remaining in NASA's 2012 budget as "very strong." In language accompanying the spending bill, legislators also urged NASA to continue working with DOE on improvements in its radioisotope propulsion system, in particular, the Advanced Stirling Radioisotope Generator, "that will allow NASA to make better, more efficient use of available Pu-238 stocks." The panel's support is good news for the planetary science community, whose research turns on NASA's ability to send missions throughout the solar system. "The supply of plutonium in the United States is diminished, or still in use, so the authorization or appropriation of funds to enable production of more plutonium is very important," explains Ronald Greeley, chair of NASA's planetary science advisory committee and regents professor at Arizona State University. "It's not only outer planet missions that are dependent on radioactive sources for power, but also more ambitious missions in the inner solar system" such as the dark side of the moon and Mars. A coalition of scientific societies, including the American Astronomical Society (AAS), the American Institute of Physics, the American Geophysical Union, and the American Physical Society, have been educating legislators on the issue, armed with a 2009 National Academies' report that said that resuming Pu-238 production should be a "high priority" for the White House and Congress. They see the House vote as an important step forward. "It doesn't matter whether [the funding ultimately] goes to NASA or DoE ... at this point our members just need the funding available for the program," says AAS's Bethany Johns. DOE estimates that the total cost of resuming production at between $75 million and $90 million, and that it would take 5 or 6 years to produce any new material. Its plan calls for an average production rate of 1.5 kg per year, which NASA says will satisfy its projected mission needs for missions starting in 2015.