**1AC – Warming**

#### Contention 1 is Warming

#### Newest and BEST studies show that warming is real and anthropogenic

Muller 12 (Richard A., professor of physics at the University of California, Berkeley, and a former MacArthur Foundation fellow, “The Conversion of a Climate-

Change Skeptic,” 7-28-12, <http://www.nytimes.com/2012/07/30/opinion/the-conversion-of-a-climate-change-skeptic.html?_r=2&pagewanted=all>)

CALL me a converted skeptic. Three years ago I identified problems in previous climate studies that, in my mind, threw doubt on the very existence of global warming. Last year, following an intensive research effort involving a dozen scientists, I concluded that global warming was real and that the prior estimates of the rate of warming were correct. I’m now going a step further: Humans are almost entirely the cause. My total turnaround, in such a short time, is the result of careful and objective analysis by the Berkeley Earth Surface Temperature project, which I founded with my daughter Elizabeth. Our results show that the average temperature of the earth’s land has risen by two and a half degrees Fahrenheit over the past 250 years, including an increase of one and a half degrees over the most recent 50 years. Moreover, it appears likely that essentially all of this increase results from the human emission of greenhouse gases. These findings are stronger than those of the Intergovernmental Panel on Climate Change, the United Nations group that defines the scientific and diplomatic consensus on global warming. In its 2007 report, the I.P.C.C. concluded only that most of the warming of the prior 50 years could be attributed to humans. It was possible, according to the I.P.C.C. consensus statement, that the warming before 1956 could be because of changes in solar activity, and that even a substantial part of the more recent warming could be natural. Our Berkeley Earth approach used sophisticated statistical methods developed largely by our lead scientist, Robert Rohde, which allowed us to determine earth land temperature much further back in time. We carefully studied issues raised by skeptics: biases from urban heating (we duplicated our results using rural data alone), from data selection (prior groups selected fewer than 20 percent of the available temperature stations; we used virtually 100 percent), from poor station quality (we separately analyzed good stations and poor ones) and from human intervention and data adjustment (our work is completely automated and hands-off). In our papers we demonstrate that none of these potentially troublesome effects unduly biased our conclusions. The historic temperature pattern we observed has abrupt dips that match the emissions of known explosive volcanic eruptions; the particulates from such events reflect sunlight, make for beautiful sunsets and cool the earth’s surface for a few years. There are small, rapid variations attributable to El Niño and other ocean currents such as the Gulf Stream; because of such oscillations, the “flattening” of the recent temperature rise that some people claim is not, in our view, statistically significant. What has caused the gradual but systematic rise of two and a half degrees? We tried fitting the shape to simple math functions (exponentials, polynomials), to solar activity and even to rising functions like world population. By far the best match was to the record of atmospheric carbon dioxide, measured from atmospheric samples and air trapped in polar ice. Just as important, our record is long enough that we could search for the fingerprint of solar variability, based on the historical record of sunspots. That fingerprint is absent. Although the I.P.C.C. allowed for the possibility that variations in sunlight could have ended the “Little Ice Age,” a period of cooling from the 14th century to about 1850, our data argues strongly that the temperature rise of the past 250 years cannot be attributed to solar changes. This conclusion is, in retrospect, not too surprising; we’ve learned from satellite measurements that solar activity changes the brightness of the sun very little.

#### It’s the most likely scenario for extinction

**Deibel 7** [Terry L. Professor of IR at National War College, 2007 “Foreign Affairs Strategy: Logic for American Statecraft”, Conclusion: American Foreign Affairs Strategy Today]

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

#### Climate change acts as a conflict multiplier – social unrest, civil war and political crises will all escalate as a result of changes in the environment

**Brzoska et al 12** [Michael Brzoska - Institute for Peace Research and Security Policy and Klima Campus, University of Hamburg, , Jürgen Scheffran - Research Group Climate Change and Security, Institute of Geography and Klima Campus, University of Hamburg, Grindelberg, Jason Kominek - Institute of Sociology, University of Hamburg, Michael Link - Research Unit Sustainability and Global Change, Center for Earth System Research and Sustainability, University of Hamburg, - Janpeter Schilling - School of Integrated Climate System Sciences, Klima Campus, University of Hamburg, “Climate Change and Violent Conflict”, Science 18 May 2012: 869-871, Chetan]

Long-term **historical studies** tend to **find a coincidence between climate variability and armed conflict,** in line **with** some **narratives about the** evolution and **collapse of civilizations** [e.g., (8)]. For instance, Zhang and others (9) combine a set of variables for the time period 1500–1800 to identify **climate change as a major driver of large-scale human crises** in the Northern Hemisphere. Tol and Wagner (10) cautiously conclude that, in preindustrial Europe, cooler periods were more likely to be related to periods of violence than warmer phases. Similar findings have been presented for eastern China (11). However, the results have been less conclusive for recent periods. For instance, in one study, **a significant correlation between temperature and civil war in Africa** between 1981 and **2002 is used to project a substantial climate-induced increase in the incidence of civil war in Africa until 2030 (**12). Yet, this result is not robust for an extended time period and alternative definitions of violent conflict (13). Food insecurity has been found to contribute to violence, as exemplified by recent “food riots” (14, 15), but there is little empirical evidence that climate variability is an important driver of violent land-use conflicts—e.g., in the Sahel (16). In Kenya, changing rainfall patterns have the potential to increase resource scarcity as a driver of pastoral conflict (17). However, more conflict in the form of violent livestock theft is reported during the rainy season than during drought (18). Similarly, conflicts over shared river systems have been associated with low-level violence, yet full-scale wars are unlikely [e.g., (19, 20)]. Instead, an increase in international water agreements has been observed (21). Finally, some studies suggest that **natural disasters related to extreme weather conditions** **substantially increase the risk of intrastate conflict** (22). In contrast, Bergholt and Lujala (23) find no increased likelihood of armed civil conflict due to weather-related disasters, and Slettebak (24) observes that, in crisis, cooperation frequently prevails. New research is on the way as new databases on nonstate conflicts, low-level violence, social instability events, and geo-referenced spatiotemporal patterns become available (25–27) (table S1). In addition to data needs, it is important to account for complexities in the relation between climate change and conflict. **There are multiple pathways and feedbacks between the climate system, natural resources, human security, and societal stability** (Fig. 1). Since the 1990s, there has been an extensive scientific debate on how the scarcity of natural resources affects violence and armed conflict (29, 30). More recently, conflict studies pay attention to the vulnerability of natural and social systems to climate impacts (31). Vulnerability can be broken down into three factors: (i) exposure to climate change, (ii) sensitivity to climate change, and (iii) adaptive capacity (32). The last two can be affected by conflict. **Many of the world’s poorest people are exposed to various risks to life, health, and well-being. If climate change adds to these risks, it can increase humanitarian crises and aggravate existing conflicts** without directly causing them. The question is whether human development, resilience, and adaptive capacity can compensate for increasing exposure and sensitivity to climate change. In previous decades, humanitarian aid, development assistance, and wealth per capita have increased (33), which has contributed to a reduction of global poverty as a possible driver of conflict. International **efforts to prevent and manage conflicts have** also **been strengthened**, and the number of armed conflicts has declined since the end of the Cold War (34). **In recent years, however, this trend slowed down or is being reversed.** While the number of democratic states has grown over the past half-century, **the number of fragile states with weak institutions has also increased** (35). If the debate on the securitization of climate change provokes military responses and other extraordinary measures, this could reinforce the likelihood of violent conflict. Main aspects of **security concern include interventions in fragile states, the securing of borders** (e.g., **against disaster refugees), and access to resources** (e.g., in the Mediterranean or Arctic region) [see (36)]. **Other responses to climate change** may also become causes of conflict, **including bioenergy** (as producers **compete for land and food-related resources**), nuclear power (which can lead to nuclear weapons proliferation), **or geoengineering** (through disagreements between states). Thus, **there is a need for conflict**-sensitive **mitigation** and adaptation **strategies** that contain conflict and contribute to cooperation via effective institutional frameworks, conflict management, and governance mechanisms. Research Challenges **The balance between political and social factors and climate change could shift when the global temperature reaches levels that have been unprecedented in human history**. There is reason to believe that **such a change might** **overwhelm adaptive** capacities and response **mechanisms of both social and natural systems and thus lead to “tipping points” toward societal instability and an increased likelihood of violent conflict (37).** Although some fundamental issues have been raised in previous research, numerous interdisciplinary questions still need to be investigated to understand the feedback loops involved (Table 1). Models of the various linkages can build on a rich set of tools from complexity science, multiagent systems, social-network analysis, and conflict assessment to extend previous data and experiences into future scenarios that cover different social, economic, and political contexts (28). Research across scientific disciplines will be needed to identify opportunities and coherent strategies to address societal challenges related to climate change.

#### The status quo guarantees 4C warming – limiting warming to 2C is key to solve – adaptation above this threshold is impossible

Washington Post citing the World Bank 11/19 (environmental journalist Brad Plumer, referencing a recent study by the World Bank, 11/19/12 “We’re on pace for 4°C of global warming. Here’s why that terrifies the World Bank.” http://www.washingtonpost.com/blogs/wonkblog/wp/2012/11/19/were-on-pace-for-4c-of-global-warming-heres-why-the-world-bank-is-terrified/)

Over the years at the U.N. climate talks, the goal has been to keep future global warming below 2°C. But as those talks have faltered, emissions have kept rising, and that 2°C goal is now looking increasingly out of reach. Lately, the conversation has shifted toward how to deal with 3°C of warming. Or 4°C. Or potentially more. And that topic has made a lot of people awfully nervous. Case in point: The World Bank just commissioned an analysis (pdf) by scientists at the Potsdam Institute looking at the consequences of a 4°C rise in global temperatures above pre-industrial levels by 2100. And the report appears to have unnerved many bank officials. “The latest predictions on climate change should shock us into action,” wrote World Bank President Jim Yong Kim in an op-ed after the report was released Monday. So what exactly has got the World Bank so worried? Partly it’s the prospect that a 4°C world could prove difficult—perhaps impossible—for many poorer countries to adapt to. Let’s take a closer look at the report: 1) The world is currently on pace for around 3°C to 4°C of global warming by the end of the century. In recent years, a number of nations have promised to cut their carbon emissions. The United States and Europe are even on pace to meet their goals. But those modest efforts can only do so much, especially as emissions in China and India keep rising. Even if all current pledges get carried out, the report notes, ”the world [is] on a trajectory for a global mean warming of well over 3°C.” And current climate models still suggest a 20 percent chance of 4°C warming in this emissions scenario. 2) The direct consequences of a 4°C rise in global temperatures could be stark. Four degrees may not sound like much. But, the report points out, the world was only about 4°C to 7°C cooler, on average, during the last ice age, when large parts of Europe and the United States was covered by glaciers. Warming the planet up in the opposite direction could bring similarly drastic changes, such as three feet or more of sea-level rise by 2100, more severe heat waves, and regional extinction of coral reef ecosystems. 3) Climate change would likely hit poorer countries hardest. The World Bank focuses on poverty reduction, so its climate report spends most of its time looking at how developing countries could struggle in a warmer world. For instance, a growing number of studies suggest that agricultural production could take a big hit under 3°C or 4°C of warming. Countries like Bangladesh, Egypt, Vietnam, and parts of Africa would also see large tracts of farmland made unusable by rising seas. “It seems clear,” the report concludes, “that climate change in a 4°C world could seriously undermine poverty alleviation in many regions.” 4) Yet the effects of 4°C warming haven’t been fully assessed — they could, potentially, be more drastic than expected. Perhaps the most notable bit of the World Bank report is its discussion of the limits of current climate forecasts. Many models, it notes, make predictions in a fairly linear fashion, expecting the impacts of 4°C of warming to be roughly twice as severe as those from 2°C of warming. But this could prove to be wrong. Different effects could combine together in unexpected ways: For example, nonlinear temperature effects on crops are likely to be extremely relevant as the world warms to 2°C and above. However, most of our current crop models do not yet fully account for this effect, or for the potential increased ranges of variability (for example, extreme temperatures, new invading pests and diseases, abrupt shifts in critical climate factors that have large impacts on yields and/or quality of grains). What’s more, the report points out that there are large gaps in our understanding of what 4°C of warming might bring: “For instance,” it notes, “there has not been a study published in the scientific literature on the full ecological, human, and economic consequences of a collapse of coral reef ecosystems.” 5) Some countries might not be able to adapt to a 4°C world. At the moment, the World Bank helps many poorer countries build the necessary infrastructure to adapt to a warmer world. That includes dams and seawalls, crop research, freshwater management, and so forth. But, as a recent internal review found, most of these World Bank efforts are focused on relatively small increases in temperature. This new World Bank report is less sure how to prepare for a 4°C world. “[G]iven that uncertainty remains about the full nature and scale of impacts, there is also no certainty that adaptation to a 4°C world is possible.” That’s why, the report concludes, “The projected 4°C warming simply must not be allowed to occur — the heat must be turned down. Only early, cooperative, international actions can make that happen.” So what sorts of actions might that entail? The International Energy Agency recently offered its own set of ideas for curbing greenhouse-gas emissions and keeping future warming below 2°C. That included everything from boosting renewable energy to redesigning the world’s transportation system. But so far, nations have only made small progress on most of these steps.

#### It’s try or die – we’ve approached the tipping point and absent nuclear it’s impossible to solve the threshold – renewables alone can’t even come close

Kirsch 9 (Steve, August 18, 2009, consultant on climate change and technology with a Bachelors and Masters in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology, “Add a Gigawatt a Day to Keep the Climate Crisis at Bay” <http://www.huffingtonpost.com/steve-kirsch/add-a-gigawatt-a-day-to-k_b_261728.html>)

You'd think that after all the press coverage that global warming has received that the public would be pretty well educated on exactly how fast we need to install clean power to avert an irreversible climate disaster. But the public has no clue. As far as I know, only one member of the press has asked the right questions to figure it out: Joshua Green, a senior editor of The Atlantic Monthly. Green wrote a great piece in the current issue entitled "The Elusive Green Economy." It's long but it's a great read. Green points out that the IPCC set 450ppm as a level we shouldn't exceed because otherwise climate change becomes both irreversible and catastrophic. But at the very end of his article is the real gem: he points out that we need to develop 13,000 GWe of carbon-free power (within the next 25 years) if we're to limit atmospheric carbon concentration to 450 ppm. Australian climate scientist Barry Brook was kind enough to double check the math and came up with a similar figure. I also ran it by a top scientist at DOE and he didn't even raise an eyebrow when I quoted that figure. It is also about the same as the 11,500 GWe that Saul Griffith derived. Green next points out that current global solar-power production today is only 10 GWe. In fact, in 2008, the peak solar capacity was 13.4GWe, but the average powered delivered was only 2 GWe. Yikes! That's about the capacity of a *single* nuclear plant. Compare that 2 GWe to the 13,000 GWe we need and you get a sense for the magnitude of the task ahead of us. The point is this: after decades of installing renewable power, we are nowhere close to making a small dent in the problem. In other words, if we think we are going to make the goal from solar, wind, and other renewables alone, we must be smoking something. And even if we added the big elephant of clean power, nuclear power, which can be installed in huge capacities relatively quickly when the political winds are blowing in the right direction, this is still an almost insurmountable goal. That's why at the Aspen Energy Forum held earlier this year, all of the renewable experts agreed that every clean power technology, including nuclear, has to play a role in solving the climate crisis. I'd like to give you a sense for what that 13,000 GWe figure means. Let's be generous and assume we have 30 years to install the 13,000 GWe of power we need. If we were to build a large nuclear plant every single day for the next 30 years, that would still not be enough to avert the 450ppm limit. Without nuclear as part of the mix, it's even harder and it's also a lot more expensive to meet the goal. We would have to be installing more than 1,500 large (2 MW, with enormous 100m diameter blades) wind turbines every day for 30 years. If we used desert-based concentrated solar thermal (which is much more efficient than solar photovoltaic), we'd have to install 80,000 huge 37 foot diameter dishes covering over 100 square miles every day for 30 years. Or some combination of those two. And then we'd have to cost-effectively store a lot of that power and deliver it when it is needed so you have reliable base load power all without generating any CO2 emissions. Storage is less of a problem with wind if you have a huge geographic area (which we have in the US), you massively overbuild to account for the unpredictability of wind, and you have a national transmission grid so you can move huge amounts of power when and where it is needed (which we don't have). And even with all of that in place, it's still not a guarantee that you won't have power outages when the wind is particularly low. With solar, to supply base load power, you'd need something like what Ausra is doing where they store power for up to 16 hours. Andasol uses such a thermal storage system and its electricity will cost 38 cents per kWh to produce, which makes it nearly 10 times more expensive than nuclear or coal.

#### SMR development offsets oil and gas burned in electricity production, renewables can’t provide a stable baseload or provide localized power generation – only SMRs solve warming

Loudermilk 11 [Micah K. Loudermilk, Contributor Micah J. Loudermilk is a Research Associate for the Energy & Environmental Security Policy program with the Institute for National Strategic Studies at National Defense University, contracted through ASE Inc, “Small Nuclear Reactors and US Energy Security: Concepts, Capabilities, and Costs”, http://www.ensec.org/index.php?option=com\_content&view=article&id=314:small-nuclear-reactors-and-us-energy-security-concepts-capabilities-and-costs&catid=116:content0411&Itemid=375, May 31, 2011, Chetan]

Lastly, and often ignored, is the ability of small reactors to bring a secure energy supply to locations detached from the grid. Small communities across Canada, Alaska, and other places have expressed immense interest in this opportunity. Additionally, the incorporation of small reactors may be put to productive use in energy-intensive operations including the chemical and plastics industries, oil refineries, and shale gas extraction. Doing so, especially in the fossil fuels industry would free up the immense amounts of oil and gas currently burned in the extraction and refining process. All told, small reactors possess numerous direct and indirect cost benefits which may alter thinking on the monetary competitiveness of the technology. Nuclear vs. Alternatives: a realistic picture When discussing the energy security contributions offered by small nuclear reactors, it is not enough to simply compare them with existing nuclear technology, but also to examine how they measure up against other electricity generation alternatives—renewable energy technologies and fossil fuels. Coal, natural gas, and oil currently account for 45%, 23% and 1% respectively of US electricity generation sources. Hydroelectric power accounts for 7%, and other renewable power sources for 4%. These ratios are critical to remember because idealistic visions of providing for US energy security are not as useful as realistic ones balancing the role played by fossil fuels, nuclear power, and renewable energy sources. Limitations of renewables Renewable energy technologies have made great strides forward during the last decade. In an increasingly carbon emissions and greenhouse gas (GHG) aware global commons, the appeal of solar, wind, and other alternative energy sources is strong, and many countries are moving to increase their renewable electricity generation. However, despite massive expansion on this front, renewable sources struggle to keep pace with increasing demand, to say nothing of decreasing the amount of energy obtained from other sources. The continual problem with solar and wind power is that, lacking efficient energy storage mechanisms, it is difficult to contribute to baseload power demands. Due to the intermittent nature of their energy production, which often does not line up with peak demand usage, electricity grids can only handle a limited amount of renewable energy sources—a situation which Germany is now encountering. Simply put, nuclear power provides virtually carbon-free baseload power generation, and renewable options are unable to replicate this, especially not on the scale required by expanding global energy demands. Small nuclear reactors, however, like renewable sources, can provide enhanced, distributed, and localized power generation. As the US moves towards embracing smart grid technologies, power production at this level becomes a critical piece of the puzzle. Especially since renewable sources, due to sprawl, are of limited utility near crowded population centers, small reactors may in fact prove instrumental to enabling the smart grid to become a reality. Pursuing a carbon-free world Realistically speaking, a world without nuclear power is not a world full of increased renewable usage, but rather, of fossil fuels instead. The 2007 Japanese Kashiwazaki-Kariwa nuclear outage is an excellent example of this, as is Germany’s post-Fukushima decision to shutter its nuclear plants, which, despite immense development of renewable options, will result in a heavier reliance on coal-based power as its reactors are retired, leading to a 4% increase in annual carbon emissions. On the global level, without nuclear power, carbon dioxide emissions from electricity generation would rise nearly 20% from nine to eleven billion tons per year. When examined in conjunction with the fact that an estimated 300,000 people per year die as a result of energy-based pollutants, the appeal of nuclear power expansion grows further. As the world copes simultaneously with burgeoning power demand and the need for clean energy, nuclear power remains the one consistently viable option on the table. With this in mind, it becomes even more imperative to make nuclear energy as safe as possible, as quickly as possible—a capacity which SMRs can fill with their high degree of safety and security. Additionally, due to their modular nature, SMRs can be quickly constructed and deployed widely.

#### This allows for global energy transition– ideally suited for developing countries

Solan et al 10 **–** Assistant Professor of Public Policy & Administration and Director of the Energy Policy Institute at Boise State University (David, June. “Economic and Employment Impacts of Small Modular Nuclear Reactors.” Energy Policy Institute, Center for Advanced Energy Studies. <http://epi.boisestate.edu/media/3494/economic%20and%20employment%20impacts%20of%20smrs.pdf>)

**The primary obstacle for many developing countries lies in their lack of available resources to build a large scale nuclear reactor that costs billions of dollars and requires at least several years to construct**. Aside from costs, **other key factors may inhibit the production of conventional nuclear reactors or larger fossil fuel plants within these countries** (IAEA, 2007). **Electrical grids with limited capacity are susceptible to operation and stability issues when power variations in excess of 10% of the total grid capacity occur**. **In certain countries**, regardless of whether the population is concentrated in urban areas or dispersed in remote regions, **the grid is not well developed or robust** (Carelli et al., 2010). As a result, **SMRs may be an attractive alternative due to their ability to be used as both incremental and distributed generation sources**. With this potential, however, come security concerns regarding transport and emplacement of SMRs in remote areas of some developing countries.

#### Especially now as countries are looking to follow the NRC’s lead in new technical standards and operations for SMRs

Lovering et al 12 [Jessica Lovering, Ted Nordhaus, and Michael Shellenberger are policy analyst, chairman, and president of the Breakthrough Institute, a public policy think tank and research organization. “Out of the Nuclear Closet”, September 7th, 2012, <http://www.foreignpolicy.com/articles/2012/09/07/out_of_the_nuclear_closet>, Chetan]

To move the needle on nuclear energy to the point that it might actually be capable of displacing fossil fuels, we'll need new nuclear technologies that are cheaper and smaller. Today, there are a range of nascent, smaller nuclear power plant designs, some of them modifications of the current light-water reactor technologies used on submarines, and others, like thorium fuel and fast breeder reactors, which are based on entirely different nuclear fission technologies. Smaller, modular reactors can be built much faster and cheaper than traditional large-scale nuclear power plants. Next-generation nuclear reactors are designed to be incapable of melting down, produce drastically less radioactive waste, make it very difficult or impossible to produce weapons grade material, useless water, and require less maintenance. Most of these designs still face substantial technical hurdles before they will be ready for commercial demonstration. That means a great deal of research and innovation will be necessary to make these next generation plants viable and capable of displacing coal and gas. The United States could be a leader on developing these technologies, but unfortunately U.S. nuclear policy remains mostly stuck in the past. Rather than creating new solutions, efforts to restart the U.S. nuclear industry have mostly focused on encouraging utilities to build the next generation of large, light-water reactors with loan guarantees and various other subsidies and regulatory fixes. With a few exceptions, this is largely true elsewhere around the world as well. Nuclear has enjoyed bipartisan support in Congress for more than 60 years, but the enthusiasm is running out. The Obama administration deserves credit for authorizing funding for two small modular reactors, which will be built at the Savannah River site in South Carolina. But a much more sweeping reform of U.S. nuclear energy policy is required. At present, the Nuclear Regulatory Commission has little institutional knowledge of anything other than light-water reactors andvirtually no capability to review or regulate alternative designs. This affects nuclear innovation in other countries as well, since the NRC remains, despite its many critics, the global gold standard for thorough regulation of nuclear energy. Most other countries follow the NRC's lead when it comes to establishing new technical and operational standards for the design, construction, and operation of nuclear plants. What's needed now is a new national commitment to the development, testing, demonstration, and early stage commercialization of a broad range of new nuclear technologies -- from much smaller light-water reactors to next generation ones -- in search of a few designs that can be mass produced and deployed at a significantly lower cost than current designs. This will require both greater public support for nuclear innovation and an entirely different regulatory framework to review and approve new commercial designs. In the meantime, developing countries will continue to build traditional, large nuclear powerplants. But time is of the essence. With the lion's share of future carbon emissions coming from those emerging economic powerhouses, the need to develop smaller and cheaper designs that can scale faster is all the more important. A true nuclear renaissance can't happen overnight. And it won't happen so long as large and expensive light-water reactors remain our only option. But in the end, there is no credible path to mitigating climate change without a massive global expansion of nuclear energy. If you care about climate change, nothing is more important than developing the nuclear technologies we will need to get that job done.

#### Nuclear power solves 2C

Lynas 9-14 [Mark Lynas – Climate Scientist for The Guardian, “Without nuclear, the battle against global warming is as good as lost”, September 14th, 2012, <http://www.guardian.co.uk/environment/2012/sep/14/nuclear-global-warming>, Chetan]

Let me be very clear. **Without nuclear, the battle against global warming is as good as lost.** Even many greens now admit this in private moments. We are already witnessing the first signs of the collapse in the biosphere this entails – with the Arctic in full-scale meltdown, more solar radiation is being captured by the dark ocean surface, and the weather systems of the entire northern hemisphere are being thrown into chaos. **With nuclear, there is a chance that global warming this century can be limited to 2C; without nuclear, I would guess we are heading for 4C or above. That will devastate ecosystems and societies worldwide on a scale which is unimaginable.**

### 1AC - New

#### Japanese nuclear power is at a cross-roads – improved safety standards is vital to ensure Fukushima doesn’t derail future development – key to emissions cuts and energy independence

Armitage and Nye 12 (August, Richard L. Armitage is president of Armitage International and a trustee of CSIS, former U.S. deputy secretary of state 2001-2005, Joseph S. Nye is dean emeritus of the Kennedy School of Government at Harvard University and a trustee of CSIS, “The U.S.-Japan Alliance anchoring stability in asia”, <http://csis.org/files/publication/120810_Armitage_USJapanAlliance_Web.pdf>, CMR)

Nuclear Energy

The tragedies of March 11, 2011, are fresh in our minds, and we extend our deepest condolences to all victims and those afflicted by the earthquake, tsunami, and subsequent nuclear meltdown. Understandably, the Fukushima nuclear disaster dealt a major setback to nuclear power. The setback reverberated not only throughout Japan, but also around the world. While some countries like Great Britain and China are cautiously resuming nuclear expansion plans, others, like Germany, have decided to phase out nuclear power entirely. Japan is conducting thorough examinations of its nuclear reactors and reforming its nuclear safety regulations. Despite strong public opposition to nuclear power, Prime Minister Yoshihiko Noda’s government has begun a partial restart of two nuclear reactors. Further restarts depend on safety checks and local approval. The cautious resumption of nuclear generation under such conditions is the right and responsible step in our view. Japan has made tremendous progress in boosting energy efficiency and is a world leader in energy research and development. While the people of Japan have demonstrated remarkable national unity in reducing energy consumption and setting the world’s highest standards for energy efficiency, a lack of nuclear energy in the near term will have serious repercussions for Japan. Without a restart of nuclear power plants, Japan will not be able to make meaningful progress toward her goal of cutting carbon dioxide (CO2 ) emissions by 25 percent by 2020. Nuclear power is and will remain the only substantial source of emissions-free, base load electricity generation. Environment Ministry data reportedly shows that without a nuclear restart, Japan’s emissions can fall at most by 11 percent by 2020; but with a restart, emissions reductions could approach 20 percent. 1 A permanent shutdown would boost Japan’s consumption of imported oil, natural gas, and coal. Moreover, postponing a decision on national energy policy has the potential to drive vital, energy-dependent industries out of Japan and may threaten national productivity. A permanent shutdown will also stymie responsible international nuclear development, as developing countries will continue to build nuclear reactors. China, which suspended reactor approvals for over a year following Fukushima (but did not suspend progress on ongoing projects), is restarting domestic construction of new projects and could eventually emerge as a significant international vendor. As China plans to join Russia, South Korea, and France in the major leagues of global development in civilian nuclear power, Japan cannot afford to fall behind if the world is to benefit from efficient, reliable, and safe reactors and nuclear services.

#### Future of Japanese nuclear power is uncertain – failure to immediately create a coordinated energy strategy with the US will collapse the alliance, US-Japan economic growth, Japanese soft power, and energy security

Cronin et al. 12 (Dr. Patrick M. Cronin is a Senior Advisor and Senior Director of the Asia-Pacific Security Program at the Center for a New American Security, Paul S. Giarra is the President of Global Strategies and Transformation and a retired Navy Commander, Zachary M. Hosford is a Research Associate at the Center for a New American Security, Daniel Katz is a Researcher at the Center for a New American Security, “The China Challenge Military, Economic and Energy Choices Facing the U.S.-Japan Alliance”, April,http://www.cnas.org/files/documents/publications/CNAS\_TheChinaChallenge\_Cronin\_0.pdf, CMR)

The nuclear Power inflection Point Alliance power also hinges on how – and to what degree – the United States and Japan will use nuclear power in their energy strategies. Japan has one of the most highly advanced nuclear power industries in the world. Simultaneously, there are few countries that require large, stable energy sources like Japan. Yet unlike the case of China, whose nuclear power growth is continuing unabated, the future of Japan’s nuclear power industry is in doubt following the Fukushima disaster. Despite the Fukushima disaster, nuclear power provides a safe and reliable source of energy that could help Japan to achieve the energy security and economic growth it desires. Before March 11, 2011, nuclear energy was intended to play an integral role in Japan’s energy plan. The 2010 Energy Basic Plan called for major expansion of the domestic nuclear energy industry to help double the energy self-sufficiency ratio by 2030 (from 18 percent to 40 percent). 79 However, the Fukushima incident has caused the Japanese public to question the merits of nuclear power. To test the safety of its reactors and attempt to reassure the Japanese public, Japan has currently ceased operations at all but one of the country’s 54 nuclear reactors, and all 54 are scheduled to be offline for maintenance and safety upgrades by May 2012. In addition, Japan announced that it would abandon its plan to build 14 new nuclear plants by 2030, which would have increased nuclear power’s share of energy production in Japan from 30 percent to 50 percent. 80 This change has prompted the Japanese government to revise its Energy Basic Plan, the details of which will be released in summer 2012. The costs of reversing the nuclear power trend in Japan will be significant. Following the Fukushima accident, the Tokyo Electric Power Company estimated that its additional costs for fossil fuel purchases to replace power lost from Fukushima would be $10.64 billion. 81 More importantly, however, taking all of its nuclear plants offline will cause a 10 percent power shortage in Japan and a 20 percent increase in electricity costs. 82 These consequences translate to a 1.2 percent annual loss of GDP, equating to approximately $94 billion in annual losses. 83 Because 40 percent of Japan’s electricity is used by the industrial sector, cost increases of this nature would be “extraordinarily harmful not only for industry but also for consumers who will see the costs passed down to them.” 84 The reduction of nuclear power generation in Japan introduces a high degree of uncertainty into projections of future demand for fossil fuel in Japan. Some of Japan’s older reactors could be decommissioned, and planned nuclear plants could be delayed or canceled; this would reduce the country’s nuclear power generation and increase demand for LNG. 85 However, further increases in energy efficiency could save electricity, and Japan could make strides in expanding the use of alternative sources of energy for power generation, which would decrease the demand for LNG. 86 Without firm guidance on domestic nuclear power, government and industry analysts are having particular difficulty assessing the potential vulnerability of the domestic energy system, although it appears to be insufficiently distributed. 87 In addition, there is the risk of increases in prices of fossil fuels, particularly oil and gas, as a result of the high demand of neighbors such as China and the potential for price spikes reminiscent of those during the 1970s. Diverging strategies in the United States and Japan regarding the future of their respective nuclear power industries could create national economic and political tumult that, in turn, could become a fissure in the alliance. Nuclear energy is a critical form of power production for both countries, and by reducing emphasis on it, they will be introducing a volatility into their energy strategies that could have unintended geopolitical effects. The alliance partners cannot afford to delay decisions on the role of nuclear power in their respective futures. Similarly, to focus solely on the safety problems associated with nuclear power ignores the benefits of the technology. The United States and Japan must find a way to offset both the volatility and the negative environmental impact of fossil fuels. Given the length of time necessary to construct nuclear power stations and the negative consequences of relying on fossil fuels in the immediate term, a decision on the role of nuclear power within the alliance should be made soon. Access to abundant and affordable energy sources will be critical not only for the continued geopolitical power of Japan and the United States but also for the recovery of both countries’ economies. The era of cheap oil seems to be over. Even if the world enters an age of cheap natural gas, the volatility and environmental impacts of fossil fuels will continue to present significant economic and security challenges. Renewable energy sources hold great promise but are not yet cost effective. At the same time, nuclear power remains in the balance as the United States and Japan question its role, yet plans by other regional players (including China, Vietnam and others) to create robust nuclear energy sectors continue unabated. It is possible, however, that Japan’s robust nuclear power industry – one of the most advanced in the world – will survive a potential dearth of domestic demand. Japanese companies that build nuclear reactors are pursuing projects overseas and with demand increasing around the world, Japanese industry stands to benefit. In fact, the Diet approved bilateral nuclear cooperation with Russia, South Korea, China and Vietnam in December 2011, with the possibility of including India in the future. Given progress in the international market, it might not be realistic for Japan to stop all nuclear production, but it is unclear whether external demand can keep the Japanese companies profitable without a robust home market. The use of nuclear power in Japan strengthens the nation domestically and internationally by insulating it against volatility (including supply shortages, price spikes and SLOC protection issues), as well as the harmful impacts of carbon emissions and the resulting damage to Japan’s image as a global leader in reducing the impact of greenhouse gases. Some analysts believe that Japan is destined to be closer energy partners with China than with the United States, but the possibility of competition between the two neighbors could spell trouble for both allies. Although energy security represents only one aspect of Japan’s power – and therefore must be weighed against the other power dynamics in the U.S.-Japan alliance – it is a critical aspect in the perception of power for both countries.

#### Strong alliance key to Asian stability and checking North Korean conflict

Armitage and Nye 12 (August, Richard L. Armitage is president of Armitage International and a trustee of CSIS, former U.S. deputy secretary of state 2001-2005, Joseph S. Nye is dean emeritus of the Kennedy School of Government at Harvard University and a trustee of CSIS, “The U.S.-Japan Alliance anchoring stability in asia”, http://csis.org/files/publication/120810\_Armitage\_USJapanAlliance\_Web.pdf, CMR)

Introduction This report on the U.S.-Japan alliance comes at a time of drift in the relationship. As leaders in both the United States and Japan face a myriad of other challenges, the health and welfare of one of the world’s most important alliances is endangered. Although the arduous efforts of Assistant Secretary of State Kurt Campbell and his colleagues in both governments have largely kept the alliance stable, today’s challenges and opportunities in the region and beyond demand more. Together, we face the re-rise of China and its attendant uncertainties, North Korea with its nuclear capabilities and hostile intentions, and the promise of Asia’s dynamism. Elsewhere, there are the many challenges of a globalized world and an increasingly complex security environment. A stronger and more equal alliance is required to adequately address these and other great issues of the day. For such an alliance to exist, the United States and Japan will need to come to it from the perspective, and as the embodiment, of tier-one nations. In our view, tier-one nations have significant economic weight, capable military forces, global vision, and demonstrated leadership on international concerns. Although there are areas in which the United States can better support the alliance, we have no doubt of the United States’ continuing tier-one status. For Japan, however, there is a decision to be made. Does Japan desire to continue to be a tier-one nation, or is she content to drift into tier-two status? If tier-two status is good enough for the Japanese people and their government, this report will not be of interest. Our assessment of, and recommendations for, the alliance depend on Japan being a full partner on the world stage where she has much to contribute. In posing this question, we are cognizant of the problems confounding Japan’s influence and role in the world today. Japan has a dramatically aging population and declining birth rate. Her debt-to-GDP ratio is over 200 percent. The Japanese people have been served by six different prime ministers in six years. And, there is a growing sense of pessimism and inward focus among many young Japanese. But, Japan is not destined to see her importance wane. Japan is fully capable of remaining a tier-one nation. It is only a question of her disposition. As many challenges as Japan faces, there exist many underappreciated and underutilized dimensions of Japan’s national power and influence. Japan is the world’s third-largest economy, with a consumer sector twice the size of China’s. Japan continues to have tremendous economic potential that could be unleashed by reform and competition. More openness to free trade and immigration and greater participation by women in the workforce would add significantly to Japan’s gross domestic product (GDP) growth. Japan’s soft power is also considerable. She rates among the top three countries in international respect and first in the world in terms of “national brand.” Japan’s Self-Defense Forces (JSDF)—now the most trusted institution in Japan—are poised to play a larger role in enhancing Japanese security and reputation if anachronistic constraints can be eased. Japan is not an insignificant country positioned in a quiet part of the world. The United States and others rely on Japan as the maritime lynchpin to a stable, strategic equilibrium in the AsiaPacific region; the second-largest contributor to the United Nations (UN), International Monetary Fund (IMF), and other leading multinational institutions; and the host of U.S. forces that keep sea-lanes open for the world’s most dynamic hemisphere. The United States needs a strong Japan no less than Japan needs a strong United States. And, it is from this perspective that we address the alliance and its stewardship. For Japan to remain standing shoulder-to-shoulder with the United States, she will need to move forward with us. Japan has been a leader in Asia in the past and can continue to be in the future. The following report presents a consensus view of the members of a bipartisan study group on the U.S.-Japan alliance. The report specifically addresses energy, economics and global trade, relations with neighbors, and security-related issues. Within these areas, the study group offers policy recommendations for Japan and the United States, which span near- and long-term time frames. These recommendations are intended to bolster the alliance as a force for peace, stability, and prosperity in the Asia-Pacific region and beyond.

#### Korea war turns every impact and causes extinction

**Hayes and Green 10** (Peter, Professor of International Relations – Royal Melbourne Institute of Technology and Director – Nautilus Institute, and Michael Hamel, Victoria University, “The Path Not Taken, the Way Still Open: Denuclearizing the Korean Peninsula and Northeast Asia”, Nautilus Institute Special Report, 1-5, http://www.nautil us.org/fora/security/10001HayesHamalGreen.pdf)

At worst, there is the possibility of nuclear attack1, whether by intention, miscalculation, or merely accident, leading to the resumption of Korean War hostilities. On the Korean Peninsula itself, key population centres are well within short or medium range missiles. The whole of Japan is likely to come within North Korean missile range. Pyongyang has a population of over 2 million, Seoul (close to the North Korean border) 11 million, and Tokyo over 20 million. Even a limited nuclear exchange would result in a ~~holocaust~~ [catastrophe] of unprecedented proportions. But the catastrophe within the region would not be the only outcome. New research indicates that even a limited nuclear war in the region would rearrange our global climate far more quickly than global warming. Westberg draws attention to new studies modelling the effects of even a limited nuclear exchange involving approximately 100 Hiroshima-sized 15 kt bombs2 (by comparison it should be noted that the United States currently deploys warheads in the range 100 to 477 kt, that is, individual warheads equivalent in yield to a range of 6 to 32 Hiroshimas).The studies indicate that the soot from the fires produced would lead to a decrease in global temperature by 1.25 degrees Celsius for a period of 6-8 years.3 In Westberg’s view: That is not global winter, but the nuclear darkness will cause a deeper drop in temperature than at any time during the last 1000 years. The temperature over the continents would decrease substantially more than the global average. A decrease in rainfall over the continents would also follow…The period of nuclear darkness will cause much greater decrease in grain production than 5% and it will continue for many years...hundreds of millions of people will die from hunger…To make matters even worse, such amounts of smoke injected into the stratosphere would cause a huge reduction in the Earth’s protective ozone.4 These, of course, are not the only consequences. Reactors might also be targeted, causing further mayhem and downwind radiation effects, superimposed on a smoking, radiating ruin left by nuclear next-use. Millions of refugees would flee the affected regions. The direct impacts, and the follow-on impacts on the global economy via ecological and food insecurity, could make the present global financial crisis pale by comparison. How the great powers, especially the nuclear weapons states respond to such a crisis, and in particular, whether nuclear weapons are used in response to nuclear first-use, could make or break the global non proliferation and disarmament regimes. There could be many unanticipated impacts on regional and global security relationships5, with subsequent nuclear breakout and geopolitical turbulence, including possible loss-of-control over fissile material or warheads in the chaos of nuclear war, and aftermath chain-reaction affects involving other potential proliferant states. The Korean nuclear proliferation issue is not just a regional threat but a global one that warrants priority consideration from the international community.

#### War in Asia escalates to global nuclear war

Landay 00 (Jonathan S., National Security and Intelligence Correspondent, Knight Ridder/Tribune News Service, 3-10, Lexis)

Few if any experts think China and Taiwan, North Korea and South Korea, or India and Pakistan are spoiling to fight. But even a minor miscalculation by any of them could destabilize Asia, jolt the global economy and even start a nuclear war. India, Pakistan and China all have nuclear weapons, and North Korea may have a few, too. Asia lacks the kinds of organizations, negotiations and diplomatic relationships that helped keep an uneasy peace for five decades in Cold War Europe. “Nowhere else on Earth are the stakes as high and relationships so fragile,” said Bates Gill, director of northeast Asian policy studies at the Brookings Institution, a Washington think tank. “We see the convergence of great power interest overlaid with lingering confrontations with no institutionalized security mechanism in place. There are elements for potential disaster.” In an effort to cool the region’s tempers, President Clinton, Defense Secretary William S. Cohen and National Security Adviser Samuel R. Berger all will hopscotch Asia’s capitals this month. For America, the stakes could hardly be higher. There are 100,000 U.S. troops in Asia committed to defending Taiwan, Japan and South Korea, and the United States would instantly become embroiled if Beijing moved against Taiwan or North Korea attacked South Korea. While Washington has no defense commitments to either India or Pakistan, a conflict between the two could end the global taboo against using nuclear weapons and demolish the already shaky international nonproliferation regime. In addition, globalization has made a stable Asia, with its massive markets, cheap labor, exports and resources, indispensable to the U.S. economy. Numerous U.S. firms and millions of American jobs depend on trade with Asia that totaled $600 billion last year, according to the Commerce Department.

#### SMR’s correct the risks of Japanese designs – ensures adoption

Thomas White International ’11 (a research-driven investment manager and independent research provider based in Chicago and Bangalore, India, Our analysts in the U.S. and Asia use proprietary, time-tested methods, “The Green Report”, April 13, http://www.thomaswhite.com/explore-the-world/green-report/2011/nuclear-power-post-fukushima-and-small-modular-reactors.aspx, CMR)

Nonetheless, despite the current negative publicity over nuclear power, there is an underlying optimism that defines the attitude of companies supporting SMRs. After all, without nuclear power the earth will be emitting two billion more tons of carbon dioxide a year. Despite the risks involved in nuclear power there are few alternative sources of power that are as clean as nuclear power. Consequently, venture capital firms supporting SMRs view the current opposition to nuclear power as temporary. CMEA Ventures, a venture capital firm, is optimistic about its plans to raise $200 million for NuScale, a firm engaged in developing SMRs. Furthermore, the Japanese accident could actually present SMRs with a potential advantage. In the case of Fukushima, it was the failure of the cooling systems, a combination of pumps and valves that actually led to the eventual overheating of the reactor. In contrast, SMRs do not require external pumps or extensive cooling systems to cool the reactor. In certain SMRs, cooling happens immediately and naturally once the system is idled, making a Fukushima-style accident with SMRs improbable. Moreover, even in case of a nuclear disaster, the damage is likely to be localized as the reactor of an SMR is buried several feet deep below the ground. Still many countries, after watching the Japanese struggle in Fukushima, have curtailed their nuclear ambitions. Germany was the most prominent among them. Even China has said it would review its policy of operating large nuclear reactors. Other European countries, such as Denmark, Greece and Austria, have been stubbornly anti-nuclear too. But for every country that opposes nuclear power two seem to support it. France and Finland have not spoken against the industry and seem to acknowledge the usefulness of nuclear power. Despite the recent scare in Japan, Argentina’s plan to install a 25-megawatt SMR prototype in 2014 is on schedule. Rosatom Corp, a Russian nuclear company, has said it will sell nearly three SMR equipped barges in 2011. If these reactors operate safely over the next couple of years without causing major problems, then the market for SMRs could expand gradually. And perhaps the future of nuclear power would have a reversal of fortune once more.

#### US nuclear leadership is key to safe Japanese nuclear development and revitalizing the alliance

Armitage and Nye 12 August 2k12 (Richard L. Armitage is president of Armitage International and a trustee of CSIS, former U.S. deputy secretary of state 2001-2005, Joseph S. Nye is dean emeritus of the Kennedy School of Government at Harvard University and a trustee of CSIS, “The U.S.-Japan Alliance anchoring stability in asia”, http://csis.org/files/publication/120810\_Armitage\_USJapanAlliance\_Web.pdf, CMR)

For its part, the United States needs to remove uncertainty surrounding disposal of spent nuclear waste and implement clear permitting processes. While we are fully cognizant of the need to learn from Fukushima and implement corrective safeguards, nuclear power still holds tremendous potential in the areas of energy security, economic growth, and environmental benefits. Japan and the United States have common political and commercial interests in promoting safe and reliable civilian nuclear power domestically and internationally. Tokyo and Washington must revitalize their alliance in this area, taking on board lessons from Fukushima, and resume a leadership role in promoting safe reactor designs and sound regulatory practices globally. The 3-11 tragedy should not become the basis for a greater economic and environmental decline. Safe, clean, responsibly developed and utilized nuclear power constitutes an essential element in Japan’s comprehensive security. In this regard, U.S.-Japan cooperation on nuclear research and development is essential.

#### Japanese energy security key to prevent competition and war with China – specifically, the East China Sea

Cronin et al. ’12 (Dr. Patrick M. Cronin is a Senior Advisor and Senior Director of the Asia-Pacific Security Program at the Center for a New American Security, Paul S. Giarra is the President of Global Strategies and Transformation and a retired Navy Commander, Zachary M. Hosford is a Research Associate at the Center for a New American Security, Daniel Katz is a Researcher at the Center for a New American Security, “The China Challenge Military, Economic and Energy Choices Facing the U.S.-Japan Alliance”, April,http://www.cnas.org/files/documents/publications/CNAS\_TheChinaChallenge\_Cronin\_0.pdf, CMR)

China’s rising energy Demands As the United States and Japan seek to enhance their energy security, the allies will need to grapple with China’s growing energy needs. Longstanding concern in Tokyo over the stability of energy supplies, especially oil, has intensified as China has switched from being an exporter to being a largescale importer. In many cases (with the possible exception of Japan and Russia), competition over securing access to energy sources has rendered East Asian countries unable to cooperate to secure their mutual interests. China’s economic growth requires – and is made possible by – access to stable energy supplies. In the midst of its upsurge in energy demand, China recently overtook Japan as the world’s largest importer of coal, and its consumption is anticipated to grow each year for the next 15 years. 71 In that same period – assuming relatively steady growth rates – China is likely to become the world’s largest importer of oil, surpassing the United States. 72 China’s oil import dependence is projected to increase from 54 percent in 2010 to 84 percent in 2035, and its natural gas import dependence is projected to increase from 9 percent in 2009 to 42 percent in 2035. 73 After a brief pause in the wake of the Fukushima accident, China is also pushing forward with an aggressive expansion of civilian nuclear power production. 74China’s demand for energy – particularly fossil fuels – is likely to lead to intense competition with other countries. Consequences of this competition will not only manifest themselves in steadily higher energy prices and acute price spikes but also through tensions with neighbors over territorial rights to oil and gas fields, as well as the maritime routes necessary to transport those resources. The East China Sea is the site of intense hydrocarbon prospecting by both Chinese and Japanese companies. It is also a potential flashpoint. In September 2005, a Japanese P-3C surveillance aircraft identified five People’s Liberation Army Navy vessels – including a guided destroyer – sailing around the contested Chunxiao Gas Field in the East China Sea. 75 Given China’s reactions to seismic surveys conducted by other countries – including the cutting of cables on Vietnamese ships – it is reasonable to conclude that China may react in similar ways to Japan. 76 Predictably, in early February 2012, China turned back a Japanese survey ship exploring disputed waters. Military tensions over energy supplies are not limited to prospecting conflicts. The transport of oil, gas and other energy supplies requires securing sea lines of communication (SLOCs). More than half of China’s imported oil originates in the Middle East, and over 85 percent of its total imported oil transits strategic maritime routes, including the Straits of Hormuz and Malacca. 77 Chinese ships defending resource-rich areas pose security risks and increase the likelihood of inadvertent contact and potential instances of limited conflict between China and Japan. This is particularly worrisome as China rapidly expands its maritime capability, with large increases in the number of vessels in its inventory and its experiences in conducting operations away from the Chinese coast. 78 Although Japan and China share many of the same maritime transportation routes, it will be difficult for Japan to put aside past confrontation with China and cooperate over SLOCs. This will open the possibility for further tension between the two economic giants. Japan could reduce its vulnerability by seeking to tie itself to American fossil fuel exports and establish supply routes across the Pacific Ocean all the way to the Gulf of Mexico. One way for Japan to create a closer energy relationship with the United States would be to become part of a trade agreement with NAFTA. How Japan chooses to proceed will affect U.S.-Japan calculations for energy security and, therefore, the overall trajectory of the alliance

#### East-China Sea conflict draws in great powers

Auslin ’12 (Michael, resident scholar in Asian and security studies at the American Enterprise Institute, “Don’t Forget About the East China Sea”, May 3,http://www.cnas.org/files/documents/publications/CNAS\_ESCS\_bulletin2.pdf, CMR)

The East China Sea may be the most strategic location in all of Asia. While the media and policymakers have paid considerable attention to the geopolitical significance of the South China Sea, the East China Sea deserves equal attention. Like the South China Sea, it is rife with contested territorial claims, larger military buildups among the principal players of the region and a geopolitical significance that impinges even more directly on long-standing U.S. security commitments. It is a nexus of competition between Asia’s two great powers, China and Japan, and it is an area in which the United States plans to retain sufficient military presence to shape the maritime environment. Disruption of free navigation there would affect the economies of the three major countries in the region – China, Japan and South Korea – and could drag in Russia, which increasingly exports its natural resources through the East China Sea. Conflict in the East China Sea could trigger a tripwire effect, requiring the United States to increase the number of military forces that are forward stationed in Asia.

**1AC – Plan**

#### Plan: The United States federal government should substantially increase production cost incentives for domestic deployment of small modular nuclear reactors

### 1AC – Solvency

#### Contention 3 is Solvency –

#### Lack of financing is the biggest obstacle to plant construction

Domenici and Meserve 10[Pete V. Domenici and Dr. Richard Meserve – Bipartisan Policy Center, “Letter to Chairman Jaczko – Chairman of the Nuclear Regulatory Commission”, April 6th, 2010, <http://bipartisanpolicy.org/sites/default/files/NRC%20Licensing%20Review.pdf>, Chetan]

In summary, we found that, while many of the stakeholders have encountered some problems in maneuvering through the licensing process, there was a **near-unanimous** view that all parties have acted appropriately and in good faith to resolve any problems. The NRC was not seen to have needlessly delayed or extended the licensing process. Based on our interviews, we believe that the difficulty of obtaining **financing is a bigger obstacle** to nuclear plant construction at the moment than licensing issues.

#### DOE approved half-the-cost of initial reactors in November and Obama has taken credit – takes out any perception or funding disads

Koch 11/27 (USA Today, 11/27/12, Wendy Koch, covers Congress for USA Today since 1998. Former investigative reporter and diplomatic correspondent for Hearst Newspapers, and foreign policy writer for the U.S. Voice of America, master's degree, magna cum laude, from Georgetown University's School of Foreign Service, “Nuclear industry looks toward smaller reactors” http://www.usatoday.com/story/news/nation/2012/11/26/nuclear-small-modular-reactors/1727001/)

These small modular reactors (SMRs), about a third the physical size of traditional ones, would be portable and built mostly in factories. They got a boost last week from the Department of Energy, which announced it would pay up to half the cost to design and license the first ones for the U.S. commercial market. "It (DOE funding) lets us put our foot on the accelerator," says Christopher Mowry of Babcock & Wilcox, an energy technology company based in Charlotte, that's been working on the "mPower" design for four years with the Tennessee Valley Authority and Bechtel International. He plans to submit it to the Nuclear Regulatory Commission in mid-2014, aiming for approval in 2017 and construction of up to four reactors at TVA's Clinch River Site in Oak Ridge, Tenn., by October 2021. Citing nuclear energy as "low carbon," Energy Secretary Steven Chu said the award is part of President Obama's push for a broad, "all-of-the-above" energy strategy that reduces greenhouse gas emissions. Chu said DOE will accept funding requests from other companies developing small modular reactors. The B&W one won't come cheap. Mowry expects it will cost more than $1 billion to develop it, of which up to 75% will be spent on design and licensing. Yet he and other advocates say SMRs cost less to build, improve safety and offer flexibility. They say these reactors could be made in U.S. factories and moved, or exported, to remote or small sites that cannot support large reactors.

#### Plan solves commercialization

**Rosner and Goldberg 11** (William E. Wrather Distinguished Service Professor in the Departments of Astronomy and Astrophysics and Physics at the University of Chicago, and Special Assistant to the Director at the Argonne National Laboratory (Robert and Stephen, November. “Small Modular Reactors – Key to Future Nuclear Power Generation in the U.S.” <https://epic.sites.uchicago.edu/sites/epic.uchicago.edu/files/uploads/EPICSMRWhitePaperFinalcopy.pdf>)

**Assuming that early SMR deployments will carry cost premiums (until the benefits of learning are achieved), the issue is whether federal government incentives are needed to help overcome this barrier. Some may argue that commercial deployment will occur, albeit at a slower pace, as the cost of alternatives increases to a level that makes initial SMR deployments competitive. Others may argue that SMR vendors should market initial modules at market prices and absorb any losses until a sufficient number of modules are sold that will begin to generate a profit. However, the combination of the large upfront capital investment, the long period before a return on capital may be achieved, and the large uncertainty in the potential level of return on investment make it unlikely that SMRs will be commercialized without some form of government incentive. The present analysis assumes that government incentives will be essential to bridging this gap and accelerating private sector investment (see Appendix D). It is the study team’s understanding that DOE has proposed to share the cost of certain SMR design and licensing study activities. This section analyzes possible options for government incentives for early deployments (LEAD and FOAK plants) in addition to federal cost sharing for the design and licensing effort. The present analysis considers several alternative approaches to providing such incentives, either in the form of direct or indirect government financial incentives, or through market transformation actions that will spur demand for FOAK plants in competitive applications. The study team’s approach is to identify targeted, least-cost incentives that could form the basis for further dialogue between stakeholders and policy makers.**

#### Solves cost overruns

**Rosner and Goldberg 11** (William E. Wrather Distinguished Service Professor in the Departments of Astronomy and Astrophysics and Physics at the University of Chicago, and Special Assistant to the Director at the Argonne National Laboratory (Robert and Stephen, November. “Small Modular Reactors – Key to Future Nuclear Power Generation in the U.S.” <https://epic.sites.uchicago.edu/sites/epic.uchicago.edu/files/uploads/EPICSMRWhitePaperFinalcopy.pdf>)

Production Cost Incentive: A production cost incentive is a performance-based incentive. With a production cost incentive, the government incentive would be triggered only when the project successfully operates. The project sponsors would assume full responsibility for the upfront capital cost and would assume the full risk for project construction. The production cost incentive would establish a target price, a so-called “market-based benchmark.” Any savings in energy generation costs over the target price would accrue to the generator. Thus, a production cost incentive would provide a **strong motivation** for cost control and learning improvements, since any gains greater than target levels would enhance project net cash flow. Initial SMR deployments, without the benefits of learning, will have significantly higher costs than fully commercialized SMR plants and thus would benefit from production cost incentives. Because any production cost differential would decline rapidly due to the combined effect of module manufacturing rates and learning experience, the financial incentive could be set at a declining rate, and the level would be determined on a plant-by-plant basis, based on the achievement of cost reduction targets. The key design parameters for the incentive include the following: 1. The magnitude of the deployment incentive should decline with the number of SMR modules and should phase out after the fleet of LEAD and FOAK plants has been deployed. 2. The incentive should be market-based rather than cost-based; the incentive should take into account not only the cost of SMRs but also the cost of competing technologies and be set accordingly. 3. The deployment incentive could take several forms, including a direct payment to offset a portion of production costs or a production tax credit. The Energy Policy Act of 2005 authorized a production tax credit of $18/MWh (1.8¢/kWh) for up to 6,000 MW of new nuclear power plant capacity. To qualify, a project must commence operations by 2021. Treasury Department guidelines further required that a qualifying project initiate construction, defined as the pouring of safetyrelated concrete, by 2014. Currently, two GW-scale projects totaling 4,600 MW are in early construction; consequently, as much as 1,400 MW in credits is available for other nuclear projects, including SMRs. The budgetary cost of providing the production cost incentive depends on the learning rate and the market price of electricity generated from the SMR project. Higher learning rates and higher market prices would decrease the magnitude of the incentive; lower rates and lower market prices would increase the need for production incentives. Using two scenarios (with market prices based on the cost of natural gas combined-cycle generation) yields the following range of estimates of the size of production incentives required for the FOAK plants described earlier.

#### Federal action is crucial to encourage private investing by controlling risk factors that cause regulatory delays

**Gale et al 9** (Kelley Michael, Finance Department Chair – Latham & Watkins, “Financing the Nuclear Renaissance: The Benefits and Potential Pitfalls of Federal & State Government Subsidies and the Future of Nuclear Power in California,” Energy Law Journal, Vol. 30, p. 497-552, <http://www.felj.org/docs/elj302/19gale-crowell-and-peace.pdf>)

In a similar fashion, regulatory risk insurance and loan guarantees provided by the federal government should **encourage private financing** of domestic nuclear power projects because the government providing the guarantees also **controls many of the risk factors** //which could give rise to regulatory delays in commencing commercial operation of a new nuclear project. Further, in the nuclear power industry, the federal government is reviewing development applications and reactor designs, and is equipped with a team of experts in nuclear technologies, so that if the federal government has skin in the game, so to speak, private lenders may take **additional comfort** that the government has performed a certain level of due diligence on a particular project and determined that there are no major flaws from its vantage point. Section II.D.3 below discusses the risks covered by federally provided regulatory risk insurance and the ways in which it can be adapted to best encourage private sector financing for nuclear energy.

#### Federal investment key to ensure investor confidence in the licensing process

**Wallace, 5** –President, Constellation Generation Group (Mike, 4/26. CQ Congressional Testimony, “NUCLEAR POWER 2010 INITIATIVE” Lexis)

The Department of Energy's Nuclear Power 2010 program is a necessary, but not sufficient, step toward new nuclear plant construction. We must address other challenges as well. Our industry is not yet at the point where we can announce specific decisions to build. We are not yet at the point where we can take a $1.5 billion to $2 billion investment decision to our boards of directors. We do yet not have fully certified designs that are competitive, for example. We do not know the licensing process will work as intended: That is why we are working systematically through the ESP and COL processes. We must identify and contain the risks to make sure that nothing untoward occurs after we start building. We cannot make a $1.5 $2 billion investment decision and end up spending twice that because the licensing process failed us. The industry believes federal investment is necessary and appropriate to offset some of the risks I've mentioned. We recommend that the federal government's investment include the incentives identified by the Secretary of Energy Advisory Board's Nuclear Energy Task Force in its recent report. That investment stimulus includes: 1. secured loans and loan guarantees; 2. transferable investment tax credits that can be taken as money is expended during construction; 3. transferable production tax credits; 4. accelerated depreciation. This portfolio of incentives is necessary because it's clear that no single financial incentive is appropriate for all companies, because of differences in company-specific business attributes or differences in the marketplace - namely, whether the markets they serve are open to competition or are in a regulated rate structure. The next nuclear plants might be built as unregulated merchant plants, or as regulated rate-base projects. The next nuclear plants could be built by single entities, or by consortia of companies. Business environment and project structure have a major impact on which financial incentives work best. Some companies prefer tax-related incentives. Others expect that construction loans or loan guarantees will enable them to finance the next nuclear plants. It is important to preserve both approaches. We must maintain as much flexibility as possible. It's important to understand why federal investment stimulus and investment protection is necessary and appropriate. Federal investment stimulus is necessary to offset the higher first-time costs associated with the first few nuclear plants built. Federal investment protection is necessary to manage and contain the one type of risk that we cannot manage, and that's the risk of some kind of regulatory failure (including court challenges) that delays construction or commercial operation. The new licensing process codified in the 1992 Energy Policy Act is conceptually sound. It allows for public participation in the process at the time when that participation is most effective - before designs and sites are approved and construction begins. The new process is designed to remove the uncertainties inherent in the Part 50 process that was used to license the nuclear plants operating today. In principle, the new licensing process is intended to reduce the risk of delay in construction and commercial operation and thus the risk of unanticipated cost increases. The goal is to provide certainty before companies begin construction and place significant investment at risk. In practice, until the process is demonstrated, the industry and the financial community cannot be assured that licensing will proceed in a disciplined manner, without unfounded intervention and delay. Only the successful licensing and commissioning of several new nuclear plants (such as proposed by the NuStart and Dominion-led consortia) can demonstrate that the licensing issues discussed above have been adequately resolved. Industry and investor concern over these potential regulatory impediments may require techniques like the standby default coverage and standby interest coverage contained in S. 887, introduced by Senators Hagel, Craig and others. Let me also be clear on two other important issues: 1. The industry is not seeking a totally risk-free business environment. It is seeking government assistance in containing those risks that are beyond the private sector's control. The goal is to ensure that the level of risk associated with the next nuclear plants built in the U.S. generally approaches what the electric industry would consider normal commercial risks. The industry is fully prepared to accept construction management risks and operational risks that are properly within the private sector's control. 2. The industry's financing challenges apply largely to the first few plants in any series of new nuclear reactors. As capital costs decline to the "nth-of-a-kind" range, as investors gain confidence that the licensing process operates as intended and does not represent a source of unpredictable risk, follow-on plants can be financed more conventionally, without the support necessary for the first few projects. What is needed limited federal investment in a limited number of new plants for a limited period of time to overcome the financial and economic hurdles facing the first few plants built. In summary, we believe the industry and the federal government should work together to finance the first-of-a-kind design and engineering work and to develop an integrated package of financial incentives to stimulate construction of new nuclear power plants. Any such package must address a number of factors, including the licensing/regulatory risks; the investment risks; and the other business issues that make it difficult for companies to undertake capital-intensive projects. Such a cooperative industry/government financing program is a necessary and appropriate investment in U.S. energy security.

#### Nat gas doesn’t block – investors prefer stability over volatility

Myers 13 (Richard J., Vice President – NEI, “NEI's Richard Myers on the Wall Street Journal Story on Natural Gas and Nuclear Energy,” NEI Nuclear Notes, 1-30, <http://neinuclearnotes.blogspot.com/2013/01/neis-richard-myers-on-wall-street.html>)

Electricity production issues are not quite as cut-and-dried as portrayed in the article, certainly not from the vantage point of energy companies who must evaluate an array of factors to determine what their future generating mix will and will not be. A nuclear energy facility produces benefits well beyond the electricity it generates. They include economic benefits like jobs, taxes and procurement; grid reliability benefits in the form of voltage support and ancillary services; the environmental benefit of avoided emissions; and the energy security benefits of an electricity source that adds diversity and forward price stability to the electricity supply portfolio. It also bears noting that extremely low natural gas prices in the United States are not sustainable. Low natural gas prices are caused by a combination of reduced demand for natural gas (due to subpar economic growth), abnormally mild weather for the past several winters and a major increase in supply (due to improved drilling techniques that have unlocked vast reserves of shale gas). As the result of low gas prices, producers of natural gas have already slowed drilling: the number of rigs drilling for natural gas in the United States has dropped approximately 50 percent in the past 12 months. At the same time, the historic volatility of natural gas prices continues to be seen in the spot market. Just last week, natural gas prices in New England and New York City topped $30 per million BTUs, the highest level seen this winter, according to the U.S. Energy Information Administration. For New England, this was actually the highest level seen since January 2004. Judgments about the viability of any given nuclear power plant are business decisions made by individual utilities based on economic circumstances unique to the facility. The Nuclear Energy Institute’s long-term belief is that, beyond the ongoing construction of five reactors in Georgia, South Carolina and Tennessee, new nuclear energy facilities will be built once electricity demand rebounds. Demand for electricity in the United States has not yet returned to the level seen in 2007, before the financial crisis.

#### SMRs are key to solve global resource and prolif problems and can be built in 2 years

**Silverstein 1/15** (Ken– Editor-In-Chief for Energy Central's EnergyBiz Insider, research focus in economics and energy policy, MBA, MA “After Fukushima, U.S. Seeks to Advance Small Nuclear Reactors,” 1/15/12, http://www.forbes.com/sites/kensilverstein/2013/01/15/after-fukushima-u-s-seeks-to-advance-small-nuclear-reactors/)

Smaller reactors, though, have a place: They might not only serve niche markets but they could also replace at least some of those bigger and more centralized nuclear generation. The right-sized reactors are expected to operate at high efficiencies and to have built-in advantages, ultimately giving those investments a respectable return. Such units, for example, generally come with a nuclear waste storage containment device. The facilities could also be used to create drinkable water supplies in those countries where such a resource is in short supply. According to the Sandia National Laboratory, these smaller reactors would be factory built and mass-assembled, with potential production of 50 a year. They would all have the exact same design, allowing for easier licensing and deployment than large-scale facilities. Mass production will keep the costs down to between $250 million and $500 million per unit. “This small reactor … could supply energy to remote areas and developing countries at lower costs and with a manufacturing turnaround period of two years as opposed to seven for its larger relatives,” says Tom Sanders, who has been working with Sandia. “It could also be a more practical means to implement nuclear base-load capacity comparable to natural gas-fired generating stations and with more manageable financial demands than a conventional power plant.” In the case of Sandia, the right-sized reactors would generate their own fuel as they operate. They are designed to have an extended operational life and would only need to be refueled a few times during its projected 60-year lifespan. At the same time, the reactor system would have no need for fuel handling, all of which helps to alleviate proliferation concerns. Conventional nuclear power plants in the U.S. have their reactors refueled once every 18 to 24 months.

#### SMRs avoid major licensing problems.

**Cunningham**, Policy Analyst for Energy and Climate at the American Security Project, 12 (Nick, October, American Security Project, Small Modular Reactors: A Possible Path Forward for Nuclear Power” http://americansecurityproject.org/featured-items/2012/report-small-modular-reactor/)

Another major drawback for conventional large reactors is the lack of standardization. This leads to long, expensive, and uncertain time periods for licensing and siting. SMRs can overcome this hurdle with standardized designs, standardized components, and enhanced safety from reduced reactor size, all of which are not easy to accomplish with large reactors. 31 Small Modular Reactors, as their name suggests, can be “modularized”. SMRs can be constructed in factories and actually shipped to site. Factory construction allows for greater quality control, predictability and scheduling. In contrast, large reactors are designed and built uniquely for each project, which can lead to delays and inflated costs. 3

#### SMRs can’t meltdown

**Wheeler 10** – Workforce Planning Manager with Entergy; Producer “This Week in Nuclear” Podcast (John, 11/21 “Small Modular Reactors May Offer Significant Safety & Security Enhancements.” http://thisweekinnuclear.com/?p=1193)

They are smaller, so the amount of radioactivity contained in each reactor is less. So much less in fact, that even if the worst case reactor accident occurs, the amount of radioactive material released would not pose a risk to the public. In nuclear lingo we say SMRs have a smaller “source term.”  This source term is so small we can design the plant and emergency systems to virtually eliminate the need for emergency actions beyond the physical site boundaries.  Then, by controlling access to the site boundary, we can eliminate the need for off-site protective actions (like sheltering or evacuations). These smaller reactors contain less nuclear fuel.  This smaller amount of fuel (with passive cooling I’ll mention in a minute) slows down the progression of reactor accidents.  This slower progression gives operators more time to take action to keep the reactor cool.  Where operators in large reactors have minutes or hours to react to events, operators of SMRs may have hours or even days. This means the chance of a reactor damaging accident is very, very remote. Even better, most SMRs are small enough that they cannot over heat and melt down. They get all the cooling they need from air circulating around the reactor. This is a big deal because if SMRs can’t melt down, then they can’t release radioactive gas that would pose a risk to the public.  Again, this means the need for external emergency actions is virtually eliminated. Also, some SMRs are not water cooled; they use gas, liquid salt, or liquid metal coolants that operate at low pressures.  This lower operating pressure means that if radioactive gases build up inside the containment building there is less pressure to push the gas out and into the air.  If there is no pressure to push radioactive gas into the environment and all of it stays inside the plant, then it poses no risk to the public. SMRs are small enough to be built underground. This means they will have a smaller physical footprint that will be easier to defend against physical attacks.  This provides additional benefits of lower construction costs because earth, concrete and steel are less costly than elaborate security systems in use today, and lower operating costs (a smaller footprint means a smaller security force).