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#### Global nuclear expansion now – dozens of countries

**NEI 12** [May 2012, Nuclear Energy Institute, White Paper, “Global Nuclear Power ¶ Development: Major ¶ Expansion Continues”]

Introduction¶ The development of energy policy is a balancing act for ¶ any nation. Resource availability, projections of electricity demand growth, the age of existing infrastructure and ¶ climate change goals are a few of the issues that must ¶ be addressed. A country’s decision to include nuclear ¶ energy in its portfolio can be more complex because ¶ nuclear requires a regulatory and industry infrastructure ¶ to ensure safety, ongoing access to global nuclear trade ¶ through treaties and cooperation agreements, significant ¶ capital for new plant construction and public support for ¶ peaceful use of the technology. In the aftermath of the ¶ Fukushima accident, a few countries—including Germany ¶ and Switzerland—have indicated that that they do not ¶ plan further nuclear expansion. But many more plan to ¶ proceed with nuclear power development.¶ The table on page two shows the 30 countries with existing nuclear programs, and includes their plans for new ¶ nuclear generation. Thirteen of the countries rely on ¶ nuclear power for over one-quarter of their electricity ¶ generation. Another 14 countries are moving ahead with ¶ new plant construction, and others have longer-term ¶ plans for new nuclear development. In rapidly ¶ developing countries like China and India, governments ¶ are planning a major role for new nuclear generation as ¶ they increase basic electrification and keep up with ¶ demand growth from economic expansion. ¶ The case studies in this paper provide examples of how ¶ different countries have balanced their resources and ¶ needs and determined that nuclear generation should be ¶ a part of their energy portfolios. Even in the postFukushima environment, this robust growth is expected ¶ with an additional 329 proposed¶ planned and 68 units proposed in countries without operating nuclear plants. ¶ Nuclear Countries¶ Operating Under Construction Planned Proposed¶ Country¶ As shown in the map, countries with existing nuclear programs are not the only ¶ ones planning to build nuclear plants. Some governments, like those in the ¶ United Arab Emirates and Poland, have made firm commitments to develop the ¶ infrastructure needed for a nuclear program. Other countries like Thailand and ¶ Chile are keeping nuclear energy as an option for the future by announcing ¶ proposals for new reactors. Countries will continue to evaluate policy and energy options as time passes and make appropriate decisions at the national level. ¶ For many nuclear energy will be a part of their clean energy future.¶ As the current status of new nuclear construction demonstrates, the majority of ¶ nuclear energy growth is occurring in non-OECD countries. OECD countries will ¶ build nuclear plants as they seek to replace aging generating fleets and reduce ¶ carbon emissions. But non-OECD countries are building electricity generation ¶ on a large scale to fuel high economic growth and to expand residential electrification. This presents many opportunities for U.S. suppliers to take ¶ advantage of markets aboard. ¶ Brazil¶ From the beginning of its nuclear program in the 1970s, Brazil has remained ¶ supportive of nuclear energy and its role in the country’s generation portfolio. ¶ Brazil has two operating nuclear units, Angra 1 and 2, near Rio de Janeiro, as ¶ well as facilities for uranium enrichment and fuel fabrication in Resende that ¶ serve the two domestic reactors. The planning for the first unit at Angra, a 520 ¶ MW unit designed by Westinghouse, started in the 1970s. Brazil signed a deal ¶ with West Germany for eight 1,300 MW units in the late ¶ 1970s, but economic stagnation and lower demand growth ¶ halted those plans. In 1995, construction on Angra 2 was ¶ restarted with the help of additional German investment.

#### Fast reactors inevitable – US lead key to nuke leadership

**Kirsch 9** [Steve Kirsch, founder and CEO of multiple tech companies collectively worth over %241 billion and MS in Electrical Engineering and Computer Science from MIT, November 2009, "Why We Should Build an Integral Fast Reactor Now,", ]

The genie is out of the bottle: refusing to play will not make fast reactors go away and will ultimately make us less safe. If we don’t re-start our fast reactor technology, then other countries will take the lead. France, Russia, India, Japan, and China all have fast reactor programs and all are either operating fast reactors now, or soon will be. The US shut down our last remaining fast reactor 15 years ago. Leadership is important for two reasons: 1) if we fail to lead, we will have missed taking advantage of our superior technology and missed a major economic opportunity as the premiere supplier of clean power technology and 2) the nuclear industry is in far safer hands if the US leads the way than if we abdicate. For example, if Chernobyl had been a US reactor design, that accident could never have happened.

#### Proliferation – Plan solves it

#### A. Economic incentive to forego ENR and PUREX – means no weapons

**Stanford 10** [IFR FaD context – the need for U.S. implementation of the IFR, 18 February 2010 by Barry Brook, This is a context statement for the IFR FaD series, written by Dr. George S. Stanford. George is a nuclear reactor physicist, part of the team that developed the Integral Fast Reactor. He is now retired from Argonne National Laboratory after a career of experimental work pertaining to power-reactor safety. He is the co-author of Nuclear Shadowboxing: Contemporary Threats from Cold War Weaponry. He is a founding member of the Science Council for Global Initiatives, Brave New Climate]

Background info on proliferation (of nuclear weapons). Please follow the reasoning carefully.¶ – Atomic bombs can be made with highly enriched uranium (90% U-235) or with good-quality plutonium (bomb designers want plutonium that is ~93% Pu-239).¶ – For fuel for an LWR, the uranium only has to be enriched to 3 or 4% U-235.¶ – To make a uranium bomb you don’t need a reactor — but you do need access to an enrichment facility or some other source of highly enriched uranium…¶ – Any kind of nuclear reactor can be used to make weapons-quality plutonium from uranium-238, but the uranium has to have been irradiated for only a very short period. In other words, nobody would try to make a plutonium weapon from ordinary spent fuel, because there are easier ways to get plutonium of much better quality.¶ – Plutonium for a weapon not only has to have good isotopic quality, it also has to be chemically uncontaminated. Thus the lightly irradiated fuel has to be processed to extract the plutonium in a chemically pure form. But mere possession of a reactor is not sufficient for a weapons capability — a facility using a chemical process called PUREX is also needed.¶ – Regardless of how many reactors a country has, it cannot have a weapons capability unless it has either the ability to enrich uranium or to do PUREX-type fuel reprocessing.¶ – Therefore, the spread of weapons capability will be strongly inhibited if the only enrichment and reprocessing facilities are in countries that already have a nuclear arsenal.¶ – But that can only happen if countries with reactors (and soon that will be most of the nations of the world) have absolutely ironclad guarantees that they can get the fuel they need even if they can’t make their own, regardless of how obnoxious their political actions might be.¶ – Such guarantees will have to be backed up by some sort of international arrangement, and that can only come to pass if there is effective leadership for the laborious international negotiations that will have to take place. (For a relevant discussion, see here)¶ – At present, the only nation that has a realistic potential to be such a leader is the United States.¶ – But a country cannot be such a leader in the political arena unless it is also in the technological forefront.¶ – The United States used to be the reactor-technology leader, but it abandoned that role in 1994 when it terminated the development of the IFR.¶ – Since then, other nations — China, India, Japan, South Korea, Russia, France — have proceeded to work on their own fast-reactor versions, which necessarily will involve instituting a fuel-processing capability.¶ – Thus the United States is being left behind, and is rapidly losing its ability to help assure that the global evolution of the technology of nuclear energy proceeds in a safe and orderly manner.¶ – But maybe it’s not too late yet. After all, the IFR is the fast-reactor technology with the post promise (for a variety of reasons), and is ready for a commercial-scale demonstration to settle some uncertainties about how to scale up the pyroprocess as needed, to establish better limits on the expected cost of production units, and to develop an appropriate, expeditious licensing process.

#### B. Commercial leadership and solving uranium – also solves the nuclear arsenal

**Jones 12** [The Hill, “US must remain leader in nuclear enrichment”, Retired General James L. Jones, senior fellow at the Bipartisan Policy Center and co-chairman of its Energy Project. He was national security adviser to President Obama from January 2009 to November 2010, 01/17/12]

Achieving energy security is among our nation’s most pressing requirements in this still-young century. I believe that America must employ a more strategic national energy policy if it is to overcome the many complex energy challenges that will so heavily influence its economic and national security. While our continued dependence on foreign sources of oil might remain the most visible threat to American eneurargy security, consequential energy-related threats such as climate change and the proliferation of nuclear material will continue to bear heavily on our security for many decades to come.¶ Nuclear nonproliferation, long one of America’s chief international security strategies, has been a major priority for this administration, as it has for every administration since World War II. Nuclear power is unique among energy sources because the commercial use of civilian technology is inseparable from nuclear security and proliferation concerns. The commercial trade of nuclear technology can heighten proliferation risks. Such vulnerabilities in a complex and dangerous world must continue to be managed responsibly — a primary objective of the nonproliferation laws and safeguards that accompany the export of U.S. nuclear technology. ¶ ¶ Our commercial leadership in the nuclear industry has been an enduring source of America’s influence in the global marketplace and a potent lever for promoting international cooperation in developing and enforcing nonproliferation regimes. Unfortunately, the U.S. is ceding its leadership in key areas of nuclear technology development. Of greatest concern is potential loss of leadership in the enrichment industry. The U.S. once produced a majority of the world’s supply of enriched uranium necessary to generate nuclear power, but today it produces only 25 percent. The United States Enrichment Corporation (USEC), which operates the United States’s largest commercial uranium enrichment facility, is the only U.S. majority-owned supplier. However, its plant located in Paducah, Ky., uses antiquated and inefficient technology. The enterprise is not well-positioned to compete cost-effectively and its ability to sustain operations remains in serious doubt. ¶ The loss of our only domestically-owned source of enriched uranium will severely undermine America’s influence in the industry and our leadership in vital international nonproliferation efforts. Without the United States as a reliable source of nuclear fuel, particularly in a world with increasing demand for low- and no-carbon electric generation, other nations will have greater incentive to pursue their own enrichment capabilities, increasing the risks of proliferation and the chances that civilian nuclear technology will be diverted for malign purposes. We know well the adverse effects on U.S. national security and international stability of North Korea’s and Iran’s pursuit of nuclear weapons under the guise of commercial enrichment.¶ The disappearance of a domestically owned capability would not only undermine U.S. leadership in a highly consequential arena of global commerce and security, it would render us dependent on foreign-controlled sources of uranium enrichment. This could increase the vulnerability not only of America’s commercial nuclear industry but of our national nuclear arsenal. Tritium, produced using enriched uranium, is necessary to maintain and modernize our nuclear weapons. Relying on foreign suppliers for material essential for maintaining the safety, security and reliability of our nuclear capability is unacceptable.

#### Proliferation likely now – risks Israel strikes

**Chalmers 13** [Royal United Services Institute, independent think-tank founded in 1831 by the Duke of Wellington, “The Nuclear Agenda for 2013: New Solutions to Old Problems”, RUSI Analysis, 10 Jan 2013, Hugh Chalmers, Research Analyst, Nuclear Analysis, formerly had consulting position at the Verification Research, Training and Information Centre, previously held positions at IHS Jane's and the King's College Centre for Science and Security Studies, MA in Science and Security from the King's College Department of War Studies]

After a year characterised by leadership transitions in the US, Russia, China, Japan, and South Korea, political paralysis has pushed many old nuclear problems into 2013. And through the momentum this has afforded them, they will almost certainly colour the coming year.¶ Continuing Crises¶ Chief among these old problems is the Iranian nuclear crisis. Despite increasingly bellicose rhetoric from Israel and the implementation of further sanctions, Iran's stockpile of 20%-enriched uranium almost tripled in 2012 - increasing the threat to what fragile stability exists in the Middle East. The International Atomic Energy Agency (IAEA) can neither confirm nor deny whether Iran's nuclear programme has a military dimension, and the P5+1 group of nations has yet to negotiate a satisfactory conclusion to this crisis.¶ This was in part due to the US Presidential elections in November. The lingering presence of the crisis in US election debates meant that few risks were taken by the US, and consequently the P5+1, to compromise with Iran in the latter half of 2012. And while the IAEA ended the year with a small step towards resolving its dispute with Iran, the US and its partners in the P5+1 start 2013 no closer to their goal than they were a year ago. Unless Iran dramatically reduces its production of 20%-enriched uranium (or significantly increases the conversion of enriched uranium to less-sensitive forms) its stockpile will probably cross Israel's hazy red line of 240kg before mid-2013. If this occurs, the Israeli airstrikes that were narrowly avoided in 2012 may yet haunt 2013.¶ Elections in South Korea and Japan were also coloured by North Korea's successful launch of the Unha-3 rocket in December, which also cast a shadow over the newly-formed Politburo Standing Committee in China. While the timing of the launch ostensibly commemorated the first anniversary of Kim Jong-Il's death, it served equally well as a reminder that North Korea is still prepared to use provocative displays of power to influence regional debates. The launch was rightly met by familiar condemnation from the international community, including an important call from China to abide by UN Security Council Resolutions. However, the Security Council itself has yet to add its voice to this chorus - something it did within four days of North Korea's failed rocket launch in April 2012.¶ While it is too early to judge the impact of the launch, if North Korea feels that provocation has proven productive (and that it may dodge an assertive response from the UN), it may be tempted to consider further provocation. Satellite imagery analysis suggests that North Korea has maintained a readiness to test a nuclear warhead within two week's notice. And if North Korea does indeed hope to eventually mount a nuclear warhead on a modified Unha-3 rocket, it will have to test a reliable, small-scale warhead.¶ Decaying Relations¶ Finally, since Vladimir Putin's controversial return to the Kremlin in March of 2012, a distinct chill has come over US-Russia relations. While the 'reset' in relations between the two powers successfully secured modest reductions in the strategic nuclear arsenals of the two states, it has since stumbled over the deployment of US ballistic missile defence systems in Europe, and fallen over Russia's tit-for-tat response to the blacklisting of select Russian individuals by the US Magnitsky act at the end of 2012.¶ Two important symptoms of this deteriorating relationship will manifest themselves this year. The Nunn-Lugar Cooperative Threat Reduction Program, which safeguarded and dismantled weapons of mass destruction in the former Soviet Union, and the Megatons to Megawatts Program, which converted Russian weapons-origin fissile material into fuel for US reactors, will be dropped by Russia before 2013 is out. Without a thaw in relations between the US and Russia, and the reinvigoration of bilateral nuclear arms control between the two powers, 2013 may leave the global nuclear disarmament movement in a worse state than it found it.

#### Israel strike causes great power war

José Miguel Alonso Trabanco 2009; researcher for Global Research, “The Middle Eastern Powder Keg Can Explode at Anytime,” globalresearch.ca/index.php?context=va&aid=11762

In case of an Israeli and/or American attack against Iran, Ahmadinejad's government will certainly respond. A possible countermeasure would be to fire Persian ballistic missiles against Israel and maybe even against American military bases in the regions. Teheran will unquestionably resort to its proxies like Hamas or Hezbollah (or even some of its Shiite allies it has in Lebanon or Saudi Arabia) to carry out attacks against Israel, America and their allies, effectively setting in flames a large portion of the Middle East. The ultimate weapon at Iranian disposal is to block the Strait of Hormuz. If such chokepoint is indeed asphyxiated, that would dramatically increase the price of oil, this a very threatening retaliation because it will bring intense financial and economic havoc upon the West, which is already facing significant trouble in those respects. In short, the necessary conditions for a major war in the Middle East are given. Such conflict could rapidly spiral out of control and thus a relatively minor clash could quickly and dangerously escalate by engulfing the whole region and perhaps even beyond. There are many key players: the Israelis, the Palestinians, the Arabs, the Persians and their respective allies and some great powers could become involved in one way or another (America, Russia, Europe, China). Therefore, any miscalculation by any of the main protagonists can trigger something no one can stop. Taking into consideration that the stakes are too high, perhaps it is not wise to be playing with fire right in the middle of a powder keg.

#### New proliferators will be uniquely destabilizing -- guarantees conflict escalation.

Cimbala, ‘8

[Stephen, Distinguished Prof. Pol. Sci. – Penn. State Brandywine, Comparative Strategy, “Anticipatory Attacks: Nuclear Crisis Stability in Future Asia”, 27, InformaWorld]

If the possibility existed of a mistaken preemption during and immediately after the Cold War, between the experienced nuclear forces and command systems of America and Russia, then it may be a matter of even more concern with regard to states with newer and more opaque forces and command systems. In addition, the Americans and Soviets (and then Russians) had a great deal of experience getting to know one another’s military operational proclivities and doctrinal idiosyncrasies, including those that might influence the decision for or against war. Another consideration, relative to nuclear stability in the present century, is that the Americans and their NATO allies shared with the Soviets and Russians a commonality of culture and historical experience. Future threats to American or Russian security from weapons of mass destruction may be presented by states or nonstate actors motivated by cultural and social predispositions not easily understood by those in the West nor subject to favorable manipulation during a crisis. The spread of nuclear weapons in Asia presents a complicated mosaic of possibilities in this regard. States with nuclear forces of variable force structure, operational experience, and command-control systems will be thrown into a matrix of complex political, social, and cultural crosscurrents contributory to the possibility of war. In addition to the existing nuclear powers in Asia, others may seek nuclear weapons if they feel threatened by regional rivals or hostile alliances. Containment of nuclear proliferation in Asia is a desirable political objective for all of the obvious reasons. Nevertheless, the present century is unlikely to see the nuclear hesitancy or risk aversion that marked the Cold War, in part, because the military and political discipline imposed by the Cold War superpowers no longer exists, but also because states in Asia have new aspirations for regional or global respect.12 The spread of ballistic missiles and other nuclear-capable delivery systems in Asia, or in the Middle East with reach into Asia, is especially dangerous because plausible adversaries live close together and are already engaged in ongoing disputes about territory or other issues.13 The Cold War Americans and Soviets required missiles and airborne delivery systems of intercontinental range to strike at one another’s vitals. But short-range ballistic missiles or fighter-bombers suffice for India and Pakistan to launch attacks at one another with potentially “strategic” effects. China shares borders with Russia, North Korea, India, and Pakistan; Russia, with China and NorthKorea; India, with Pakistan and China; Pakistan, with India and China; and so on. The short flight times of ballistic missiles between the cities or military forces of contiguous states means that very little time will be available for warning and attack assessment by the defender. Conventionally armed missiles could easily be mistaken for a tactical nuclear first use. Fighter-bombers appearing over the horizon could just as easily be carrying nuclear weapons as conventional ordnance. In addition to the challenges posed by shorter flight times and uncertain weapons loads, potential victims of nuclear attack in Asia may also have first strike–vulnerable forces and command-control systems that increase decision pressures for rapid, and possibly mistaken, retaliation. This potpourri of possibilities challenges conventional wisdom about nuclear deterrence and proliferation on the part of policymakers and academic theorists. For policymakers in the United States and NATO, spreading nuclear and other weapons of mass destruction in Asia could profoundly shift the geopolitics of mass destruction from a European center of gravity (in the twentieth century) to an Asian and/or Middle Eastern center of gravity (in the present century).14 This would profoundly shake up prognostications to the effect that wars of mass destruction are now passe, on account of the emergence of the “Revolution in Military Affairs” and its encouragement of information-based warfare.15 Together with this, there has emerged the argument that large-scale war between states or coalitions of states, as opposed to varieties of unconventional warfare and failed states, are exceptional and potentially obsolete.16 The spread of WMD and ballistic missiles in Asia could overturn these expectations for the obsolescence or marginalization of major interstate warfare.

#### Extinction

Krieger, ‘9

[David, Pres. Nuclear Age Peace Foundation and Councilor – World Future Council, “Still Loving the Bomb After All These Years”, 9-4, https://www.wagingpeace.org/articles/2009/09/04\_krieger\_newsweek\_response.php?krieger]

Jonathan Tepperman’s article in the September 7, 2009 issue of Newsweek, “Why Obama Should Learn to Love the Bomb,” provides a novel but frivolous argument that nuclear weapons “may not, in fact, make the world more dangerous….” Rather, in Tepperman’s world, “The bomb may actually make us safer.” Tepperman shares this world with Kenneth Waltz, a University of California professor emeritus of political science, who Tepperman describes as “the leading ‘nuclear optimist.’” Waltz expresses his optimism in this way: “We’ve now had 64 years of experience since Hiroshima. It’s striking and against all historical precedent that for that substantial period, there has not been any war among nuclear states.” Actually, there were a number of proxy wars between nuclear weapons states, such as those in Korea, Vietnam and Afghanistan, and some near disasters, the most notable being the 1962 Cuban Missile Crisis. Waltz’s logic is akin to observing a man falling from a high rise building, and noting that he had already fallen for 64 floors without anything bad happening to him, and concluding that so far it looked so good that others should try it. Dangerous logic! Tepperman builds upon Waltz’s logic, and concludes “that all states are rational,” even though their leaders may have a lot of bad qualities, including being “stupid, petty, venal, even evil….” He asks us to trust that rationality will always prevail when there is a risk of nuclear retaliation, because these weapons make “the costs of war obvious, inevitable, and unacceptable.” Actually, he is asking us to do more than trust in the rationality of leaders; he is asking us to gamble the future on this proposition. “The iron logic of deterrence and mutually assured destruction is so compelling,” Tepperman argues, “it’s led to what’s known as the nuclear peace….” But if this is a peace worthy of the name, which it isn’t, it certainly is not one on which to risk the future of civilization. One irrational leader with control over a nuclear arsenal could start a nuclear conflagration, resulting in a global Hiroshima. Tepperman celebrates “the iron logic of deterrence,” but deterrence is a theory that is far from rooted in “iron logic.” It is a theory based upon threats that must be effectively communicated and believed. Leaders of Country A with nuclear weapons must communicate to other countries (B, C, etc.) the conditions under which A will retaliate with nuclear weapons. The leaders of the other countries must understand and believe the threat from Country A will, in fact, be carried out. The longer that nuclear weapons are not used, the more other countries may come to believe that they can challenge Country A with impunity from nuclear retaliation. The more that Country A bullies other countries, the greater the incentive for these countries to develop their own nuclear arsenals. Deterrence is unstable and therefore precarious. Most of the countries in the world reject the argument, made most prominently by Kenneth Waltz, that the spread of nuclear weapons makes the world safer. These countries joined together in the Nuclear Non-Proliferation Treaty (NPT) to prevent the spread of nuclear weapons, but they never agreed to maintain indefinitely a system of nuclear apartheid in which some states possess nuclear weapons and others are prohibited from doing so. The principal bargain of the NPT requires the five NPT nuclear weapons states (US, Russia, UK, France and China) to engage in good faith negotiations for nuclear disarmament, and the International Court of Justice interpreted this to mean complete nuclear disarmament in all its aspects. Tepperman seems to be arguing that seeking to prevent the proliferation of nuclear weapons is bad policy, and that nuclear weapons, because of their threat, make efforts at non-proliferation unnecessary and even unwise. If some additional states, including Iran, developed nuclear arsenals, he concludes that wouldn’t be so bad “given the way that bombs tend to mellow behavior.” Those who oppose Tepperman’s favorable disposition toward the bomb, he refers to as “nuclear pessimists.” These would be the people, and I would certainly be one of them, who see nuclear weapons as presenting an urgent danger to our security, our species and our future. Tepperman finds that when viewed from his “nuclear optimist” perspective, “nuclear weapons start to seem a lot less frightening.” “Nuclear peace,” he tells us, “rests on a scary bargain: you accept a small chance that something extremely bad will happen in exchange for a much bigger chance that something very bad – conventional war – won’t happen.” But the “extremely bad” thing he asks us to accept is the end of the human species. Yes, that would be serious. He also doesn’t make the case that in a world without nuclear weapons, the prospects of conventional war would increase dramatically. After all, it is only an unproven supposition that nuclear weapons have prevented wars, or would do so in the future. We have certainly come far too close to the precipice of catastrophic nuclear war. As an ultimate celebration of the faulty logic of deterrence, Tepperman calls for providing any nuclear weapons state with a “survivable second strike option.” Thus, he not only favors nuclear weapons, but finds the security of these weapons to trump human security. Presumably he would have President Obama providing new and secure nuclear weapons to North Korea, Pakistan and any other nuclear weapons states that come along so that they will feel secure enough not to use their weapons in a first-strike attack. Do we really want to bet the human future that Kim Jong-Il and his successors are more rational than Mr. Tepperman?

**Credible nuclear arsenal deters all war and solves Russia and China nuclear war**

**Payne ’12** – professor and head of Defense and Strategic Studies at Missouri State

(Dr. Keith B., Testimony to the Congressional Strategic Posture Commission, United States Senate Appropriations Subcommittee on Energy and Water Development, 7-25-2012)

The GNZC report, however, essentially dismisses this concern by asserting that Russia and China are not now opponents and are unlikely ever to be so again: “The risk of nuclear confrontation between the United States and either Russia or China belongs to the past, not the future.” Such a prediction fits the narrative for further deep reductions, but it does not appear to fit Russian or Chinese actions and statements concerning their ambitions and nuclear developments. Over the past several years, top Russian leaders have made numerous threats of pre-emptive and preventive nuclear attack against US allies and friends. Most recently, the Chief of the Russian General Staff, Gen. Nikolai Makarov threatened a pre-emptive attack against NATO states, and the threat was implicitly nuclear. 11 (Please see the attached compilation of Russian nuclear threats since 2007 by Dr. Mark Schneider). Such threats challenge Western sensibilities and faith in a powerful, global nuclear “taboo,” but they are within the norm of Russian behavior and doctrine regarding nuclear forces. To claim that nuclear weapons will not be salient in contemporary or future US relations with Russia or China is an unwarranted and highly optimistic prediction, not a prudent basis for calculating US deterrence strategies and forces. If wrong, Minimum Deterrence and corresponding low force levels could invite serious risk and provocations. Second, the question of having an adequate deterrence capability cannot be answered simply by determining if we can threaten some given, contemporary set of targets. Deterrence must work in contemporary and future crises, and we will come to those crises with the forces we have in hand. No one knows with confidence “how much of what force” will be necessary for credible deterrence now, and future requirements are particularly arcane because opponents and threats can shift rapidly in this post-Cold War era and the requirements for deterrence correspondingly can change rapidly. This reality complicates the task of calculating “how much is enough” for deterrence. The priority deterrence question now is whether we have sufficient force options and diversity to threaten credibly the wide spectrum of targets that opponents may value over the course of decades. In some plausible scenarios, a small and undiversified US nuclear force may be adequate for deterrence, in other cases, effective deterrence may demand a large and diverse nuclear arsenal with capabilities well beyond those envisaged for Minimum Deterrence. Confident declarations that some fixed Minimum Deterrence force level will prove adequate cannot be based on substance; they reflect only hope and carry considerable risk. Instead, the flexibility and resilience of our forces to adapt to differing deterrence requirements should be considered a fundamental requirement of US force adequacy, and our standing capabilities must be sufficiently large and diverse to adapt to a variety of shifting deterrence demands. It may be convenient to pick some fixed, low number and claim that 300, 400, or 500 weapons will be adequate for deterrence now and in the future, but no one can possibly know if such statements are true. We do know that the more diverse and flexible our forces, the more likely we are to have the types of capabilities needed for deterrence in a time of shifting and uncertain threats, stakes and opponents. But force diversity and flexibility does not come automatically. It is important that our nuclear force posture and infrastructure incorporate these characteristics and that they are manifest to opponents and allies for deterrence and assurance purposes respectively.

### 2

#### Warming is real and anthropogenic – CO2 is key

Rahmstorf, November 12 [Stefan Rahmstorf is a German oceanographer and climatologist. Since 2000, he has been a Professor of Physics of the Oceans at Potsdam University. He received his Ph.D. in oceanography from Victoria University of Wellington.Comparing climate projections to observations up to 2011, Stefan Rahmstorf et al 2012 Environ Res. Lett. 7 044035 [doi:10.1088/1748-9326/7/4/044035](http://dx.doi.org/10.1088/1748-9326/7/4/044035) © 2012 IOP Publishing Ltd Received 19 July 2012, accepted for publication 9 November 2012 Published 27 November 2012. <http://iopscience.iop.org/1748-9326/7/4/044035/article>]

Climate projections like those of the Intergovernmental Panel on Climate Change (IPCC [2001](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib10), [2007](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib11)) are increasingly used in decision-making. It is important to keep track of how well past projections match the accumulating observational data. Five years ago, it was found that CO2 concentration and global temperature closely followed the central prediction of the third IPCC assessment report during 1990–2006, whilst sea level was tracking along the upper limit of the uncertainty range (Rahmstorf et al [2007](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib24)). Here we present an update with five additional years of data and **using advances in removing short-term noise from global temperature data.** Atmospheric carbon dioxide concentration continues to match the prediction: **the mean value reached in 2011 was 390.5 ppm** (NOAA [2012](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib21)), only about 1.5 ppm higher than the central IPCC projections published in 2001. For historical perspective, in his article 'Are we on the brink of a pronounced global warming?', Broecker ([1975](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib1)) predicted an increase from 322 ppm observed in 1970 to 403 ppm in 2010. A more detailed analysis of anthropogenic climate forcing, which also includes other greenhouse gases, aerosols and surface albedo changes, is beyond the scope of this letter. Here we focus on two prime indicators of climate change: the evolution of global-mean temperature and sea level. 2. Global temperature evolution To compare global temperature data to projections, we need to consider that IPCC projections do not attempt to predict the effect of solar variability, or specific sequences of either volcanic eruptions or El Niño events. Solar and volcanic forcing are routinely included only in 'historic' simulations for the past climate evolution but not for the future, while El Niño–Southern Oscillation (ENSO) is included as a stochastic process where the timing of specific warm or cool phases is random and averages out over the ensemble of projection models. Therefore, model-data comparisons either need to account for the short-term variability due to these natural factors as an added quasi-random uncertainty, or the specific short-term variability needs to be removed from the observational data before comparison. Since the latter approach allows a more stringent comparison it is adopted here. Global temperature data can be **adjusted for solar variations**, **volcanic aerosols** and **ENSO using multivariate correlation analysis** (Foster and Rahmstorf [2011](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib6), Lean and Rind [2008](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib14), [2009](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib15), Schönwiese et al [2010](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib28)), since independent data series for these factors exist. We here use the data adjusted with the method exactly as described in Foster and Rahmstorf, but using data until the end of 2011. The contributions of all three factors to global temperature were estimated by linear correlation with the multivariate El Niño index for ENSO, aerosol optical thickness data for volcanic activity and total solar irradiance data for solar variability (optical thickness data for the year 2011 were not yet available, but since no major volcanic eruption occurred in 2011 we assumed zero volcanic forcing). These contributions were computed separately for each of the five available global (land and ocean) temperature data series (including both satellite and surface measurements) and subtracted. The five thus adjusted data sets were averaged in order to avoid any discussion of what is 'the best' data set; in any case the differences between the individual series are small (Foster and Rahmstorf [2011](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib6)). We show this average as a 12-months running mean in figure [1](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749fig1), together with the unadjusted data (likewise as average over the five available data series). Comparing adjusted with unadjusted data shows how the adjustment largely removes e.g. the cold phase in 1992/1993 following the Pinatubo eruption, the exceptionally high 1998 temperature maximum related to the preceding extreme El Niño event, and La Niña-related cold in 2008 and 2011. Figure 1. Observed annual global temperature, unadjusted (pink) and adjusted for short-term variations due to solar variability, volcanoes and ENSO (red) as in Foster and Rahmstorf ([2011](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib6)). 12-months running averages are shown as well as linear trend lines, and compared to the scenarios of the IPCC (blue range and lines from the third assessment, green from the fourth assessment report). Projections are aligned in the graph so that they start (in 1990 and 2000, respectively) on the linear trend line of the (adjusted) observational data. [Export PowerPoint slide](http://iopscience.iop.org/1748-9326/7/4/044035/powerpoint/figure/erl439749fig1) [Download figure (96 KB)](http://iopscience.iop.org/1748-9326/7/4/044035/downloadFigure/figure/erl439749fig1) Note that recently a new version of one of those time series has become available: version of 4 the HadCRUT data (Morice et al [2012](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib20)). Since the differences are small and affect only one of five series, the effect of this update on the average shown in figure [1](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749fig1) is negligible. We chose to include version 3 of the data in this graph since these data are available up to the end of 2011, while version 4 so far is available only up to the end of 2010. The removal of the known short-term variability components reduces the variance of the data without noticeably altering the overall warming trend: it is 0.15 °C/decade in the unadjusted and 0.16 °C/decade in the adjusted data. From 1990–2011 the trends are 0.16 and 0.18 °C/decade and for 1990–2006 they are 0.22 and 0.20 °C/decade respectively. The relatively high trends for the latter period are thus simply due to short-term variability, as discussed in our previous publication (Rahmstorf et al [2007](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib24)). During the last ten years, warming in the unadjusted data is less, due to recent La Niña conditions (ENSO causes a linear cooling trend of −0.09 °C over the past ten years in the surface data) and the transition from solar maximum to the recent prolonged solar minimum (responsible for a −0.05 °C cooling trend) (Foster and Rahmstorf [2011](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib6)). Nevertheless, unadjusted observations lie within the spread of individual model projections, which is a different way of showing the consistency of data and projections (Schmidt [2012](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib27)). Figure [1](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749fig1) shows that the adjusted observed global temperature evolution closely follows the central IPCC projections, while this is harder to judge for the unadjusted data due to their greater short-term variability. The IPCC temperature projections shown as solid lines here are produced using the six standard, illustrative SRES emissions scenarios discussed in the third and fourth IPCC reports, and do not use any observed forcing. The temperature evolution for each, including the uncertainty range, is computed with a simple emulation model, hence the temperature curves are smooth. The temperature ranges for these scenarios are provided in the summary for policy makers of each report, in figure 5 in case of the third assessment and in table SPM.3 in case of the fourth assessment (where the full time evolution is shown in figure 10.26 of the report; Meehl et al [2007](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib18)). For historic perspective, Broecker in 1975 predicted a global warming from 1980–2010 by 0.68 °C, as compared to 0.48 °C according to the linear trend shown in figure [1](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749fig1), an overestimate mostly due to his neglect of ocean thermal inertia (Rahmstorf [2010](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib23)). A few years later, Hansen et al ([1981](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib8)) analysed and included the effect of ocean thermal inertia, resulting in lower projections ranging between 0.28 and 0.45 °C warming from 1980–2010. Their upper limit thus corresponds to the observed warming trend. They further correctly predicted that the global warming signal would emerge from the noise of natural variability before the end of the 20th century. 3. Global sea-level rise Turning to sea level, the quasi linear trend **measured by satellite altimeters** since 1993 has continued essentially unchanged when extending the time series by five additional years. It continues to run near the upper limit of the projected uncertainty range given in the third and fourth IPCC assessment reports (figure [2](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749fig2)). Here, the sea-level projections provided in figure 5 of the summary for policy makers of the third assessment and in table SPM.3 of the fourth assessment are shown. The satellite-based linear trend 1993–2011 is 3.2 ± 0.5 mm yr−1, which is 60% faster than the best IPCC estimate of 2.0 mm yr−1 for the same interval (blue lines). The two temporary sea-level minima in 2007/2008 and 2010/2011 may be linked to strong La Niña events (Llovel et al [2011](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib17)). The tide gauges show much greater variability, most likely since their number is too limited to properly sample the global average (Rahmstorf et al [2012](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib25)). For sea level the fourth IPCC report did not publish the model-based time series (green lines), but these were made available online in 2012 (CSIRO [2012](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib5)). They do not differ significantly from the projections of the third IPCC report and thus continue to underestimate the observed upward trend. Figure 2. Sea level measured by satellite altimeter (red with linear trend line; AVISO data from (Centre National d'Etudes Spatiales) and reconstructed from tide gauges (orange, monthly data from Church and White ([2011](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib4))). Tide gauge data were aligned to give the same mean during 1993–2010 as the altimeter data. The scenarios of the IPCC are again shown in blue (third assessment) and green (fourth assessment); the former have been published starting in the year 1990 and the latter from 2000. [Export PowerPoint slide](http://iopscience.iop.org/1748-9326/7/4/044035/powerpoint/figure/erl439749fig2) [Download figure (91 KB)](http://iopscience.iop.org/1748-9326/7/4/044035/downloadFigure/figure/erl439749fig2) Could this underestimation appear because the high observed rates since 1993 are due to internal multi-decadal variability, perhaps a temporary episode of ice discharge from one of the ice sheets, rather than a systematic effect of global warming? **Two pieces of evidence make this very unlikely.** First, the IPCC fourth assessment report (IPCC [2007](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib11)) found a similar underestimation also for the time period 1961–2003: the models on average give a rise of 1.2 mm yr−1, while the best data-based estimate is 50% larger at 1.8 mm yr−1 (table 9.2 of the report; Hegerl et al [2007](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib9)). This is despite using an observed value for ice sheet mass loss (0.19 mm yr−1) in the 'modelled' number in this comparison. Second, the observed rate of sea-level rise on multi-decadal timescales over the past 130 years shows a highly significant correlation with global temperature (Vermeer and Rahmstorf [2009](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib30)) by which the increase in rate over the past three decades is linked to the warming since 1980, which is very unlikely to be a chance coincidence. Another issue is whether non-climatic components of sea-level rise, not considered in the IPCC model projections, should be accounted for before making a comparison to data, namely water storage in artificial reservoirs on land (Chao et al [2008](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib3)) and the extraction of fossil groundwater for irrigation purposes (Konikow [2011](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib13)). During the last two decades, both contributions approximately cancel (at −0.3 and +0.3 mm yr−1) so would not change our comparison in figure [2](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749fig2), see figure 11 of Rahmstorf et al ([2012](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib25)) based on the data of Chao et al ([2008](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib3)) and Konikow ([2011](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib13)). This is consistent with the lack of recent trend in net land-water storage according to the GRACE satellite data (Lettenmaier and Milly [2009](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib16)). For the period 1961–2003, however, the effect of dam building (which peaked in the 1970s at around −0.9 mm yr−1) very likely outstripped groundwater extraction, thus widening the gap between modelled and observed climatically-forced sea-level rise. It is instructive to analyse how the rate of sea-level rise changes over longer time periods (figure [3](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749fig3)). The tide gauge data (though noisy, see above) show that the rate of sea-level rise was around 1 mm yr−1 in the early 20th century, around 1.5–2 mm yr−1 in mid-20th-century and increased to around 3 mm yr−1 since 1980 (orange curve). The satellite series is too short to meaningfully compute higher order terms beyond the linear trend, which is shown in red (including uncertainty range). Finally, the AR4 projections are shown in three bundles of six emissions scenarios: the 'mid' estimates in green, the 'low' estimates (5-percentile) in cyan and the 'high' estimates (95-percentile) in blue. These are the scenarios that comprise the often-cited AR4-range from 18 to 59 cm sea-level rise for the period 2090–99 relative to 1980–99 (IPCC [2007](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib11)). For the period 2000–2100, this corresponds to a range of 17–60 cm sea-level rise. Figure 3. Rate of sea-level rise in past and future. Orange line, based on monthly tide gauge data from Church and White ([2011](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib4)). The red symbol with error bars shows the satellite altimeter trend of 3.2 ± 0.5 mm yr−1 during 1993–2011; this period is too short to determine meaningful changes in the rate of rise. Blue/green line groups show the low, mid and high projections of the IPCC fourth assessment report, each for six emissions scenarios. Curves are smoothed with a singular spectrum filter (ssatrend; Moore et al [2005](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib19)) of 10 years half-width. [Export PowerPoint slide](http://iopscience.iop.org/1748-9326/7/4/044035/powerpoint/figure/erl439749fig3) [Download figure (94 KB)](http://iopscience.iop.org/1748-9326/7/4/044035/downloadFigure/figure/erl439749fig3) Figure [3](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749fig3) shows that in all 'low' estimates, the rate of rise stays well below 3 mm yr−1 until the second half of the 21st century, in four of the six even throughout the 21st century. The six 'mid' estimates on average give a rise of 34 cm, very close to what would occur if the satellite-observed trend of the last two decades continued unchanged for the whole century. However, figure [3](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749fig3) shows that the reason for this relatively small projected rise is not an absence of acceleration. Rather, all these scenarios show an acceleration of sea-level rise in the 21st century, but from an initial value that is much lower than the observed recent rise. Figure [3](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749fig3) further shows that only the 'high' models represented in the range of AR4 models validate when compared to the observational data and can in this regard be considered valid projection models for the future. These 'high' model scenarios represent a range of 21st century rise of 37–60 cm. Nevertheless, this range cannot be assumed to represent the full range of uncertainty of future sea-level rise, since the 95-percentile can only represent a very small number of models, given that 23 climate models were used in the AR4. The model(s) defining the upper 95-percentile might not get the right answer for the right reasons, but possibly by overestimating past temperature rise. Note that the IPCC pointed out that its projections exclude 'future rapid dynamical changes in ice flow'. The projections now published online (CSIRO [2012](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib5)) include an alternative version that includes 'scaled-up ice sheet discharge'. These projections validate equally well (or poorly) with the observed data, since they only differ substantially in the future, not in the past, from the standard projections. The sea-level rise over 2000–2100 of the 'high' bundle of these scenarios is 46–78 cm. Alternative scalings of sea-level rise have been developed, which in essence postulate that the rate of sea-level rise increases in proportion to global warming (e.g. Grinsted et al [2009](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib7), Rahmstorf [2007](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib22)). This approach can be calibrated with past sea-level data (Kemp et al [2011](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib12), Vermeer and Rahmstorf [2009](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib30)) and leads to higher projections of future sea-level rise as compared to those of the IPCC. The latter is immediately plausible: if we consider the recently observed 3 mm yr−1 rise to be a result of 0.8 °C global warming since preindustrial times (Rahmstorf et al [2012](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib25)), then a linear continuation of the observed warming of the past three decades (leading to a 21st century warming by 1.6 °C, or 2.4 °C relative to preindustrial times) would linearly raise the rate of sea-level rise to 9 mm yr−1, as in the highest scenario in figure [3](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749fig3)—but already for a rather moderate warming scenario, not the 'worst case' emissions scenario. 4. Conclusions In conclusion, the rise in CO2 concentration and global temperature has continued to closely match the projections over the past five years, **while sea level continues to rise faster than anticipated.** The latter suggests that the 21st Century sea-level projections of the last two IPCC reports may be systematically biased low. Further support for this concern is provided by the fact that the ice sheets in Greenland and Antarctica are increasingly losing mass (Rignot et al [2011](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib26), Van den Broeke et al [2011](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib29)), while those IPCC projections assumed that Antarctica will gain enough mass in future to largely compensate mass losses from Greenland (see figure 10.33 in Meehl et al ([2007](http://iopscience.iop.org/1748-9326/7/4/044035/article#erl439749bib18))). For this reason, an additional contribution ('scaled-up ice sheet discharge') was suggested in the IPCC fourth assessment. Our results highlight the need to thoroughly validate models with data of past climate changes before applying them to projections.

#### And, it causes extinction – but US leadership can reverse it

Ferris, 1/17/13 [The Big Thaw, [Elizabeth Ferris](http://www.brookings.edu/experts/ferrise) Co-Director, [Brookings-LSE Project on Internal Displacement](http://www.brookings.edu/about/projects/idp), <http://www.brookings.edu/research/papers/2013/01/the-big-thaw>

Global warming is occurring at a faster pace than predicted by scientists. Temperatures are rising, icecaps and glaciers are melting, and extreme weather events are becoming both more frequent and more intense. Last fall, the National Snow and Ice Data Center documented a record low of the level of Arctic sea ice – a figure 49 percent lower than the 1979-2000 average. If these trends continue, the results will be far-reaching for life on this planet. But **if** the **warming accelerates** dramatically and if polar ice melts even faster, the results could be catastrophic. This could occur if the Greenland ice sheet or the West Antarctica Ice Sheet (WAIS) collapses, triggering a significant rise in sea levels throughout the world with particularly devastating impacts on populations living in low-lying coastal areas. Although the effects of climate change are likely to be long-term and the worst effects will probably neither be experienced in your presidency nor even in your lifetime, the future is inherently unpredictable. Climate change is already affecting communities around the world. It is likely to produce devastating consequences whether in the near or distant future. Taking bold steps now to address climate change offers an opportunity for you not only to leave a legacy that will impact future generations but also an opportunity to address current problems resulting from the effects of climate change. Recommendations: • Raise the priority of climate change on your foreign policy agenda, in particular by re-vitalizing negotiations over a post-Kyoto treaty. The Doha round of negotiations, which ended last month, was disappointing. Countries are further away today than they were a year ago on reducing emissions. **U.S. leadership can** reverse **current** trends **of** inadequate **global** commitment **to** reduceg**reen**h**ouse** gases**.** • Support measures that will enable communities and countries to adapt to the most egregious effects of climate change. On the international level this means supporting and leading the difficult discussions around climate finance and using U.S. aid to support government planning to respond to the effects of climate change, including financial assistance to encourage communities to stay where they are as well as to plan for the relocation of communities whose homes will no longer be habitable. • Support effective multilateral action to increase both mitigation and adaptation measures. Use your influence with the multilateral development banks to encourage more attention to disaster riskreduction measures in development planning. Work with international agencies and legal experts to devise an international legal regime for dealing with the expected increase in trans-border migration. It is easier to put a system in place before a crisis is at hand. • Strengthen domestic efforts to mitigate the effects of climate change by reducing carbon emissions and enhancing domestic capacity to prepare for, respond, and recover from sudden-onset natural disasters. Background: Since the first report of the Intergovernmental Panel on Climate Change (IPCC) in 1990, the projections about the impact of global warming have become direr. From projecting the widespread consequences of a global rise in temperature of 2 degrees Celsius by the end of the century, current projections are that the rise in temperature will double to 4 degrees Celsius. The seas are rising 60 percent faster than predicted by the IPCC. The Greenland ice sheet is shrinking twice as fast as estimated by the IPCC and is losing mass at about five times the rate it was in the early 1990s. If the Greenland ice sheet were to melt completely, global sea rise could reach seven meters. And the consequences of global warming go far beyond sea-level rise. For example, the National Oceanic and Atmospheric Administration warns that the conditions that led to the 2011 Texas drought are 20 times more likely to occur now than in the 1960s as a result of increases in greenhouse gas concentrations. Although climate change will have many negative effects in different parts of the world, including prolonged droughts, reduction in arable land, declining agricultural productivity, and increased flooding due to more extreme weather events, the impact of sea level rise perhaps best illustrates the potential dangers. Throughout the world, more people are living in coastal areas as the result of population growth, urbanization and government policies. Presently 10 percent of the world’s population — 600 million people — live in low-elevation coastal zones and the percentage is growing. Sixty-five percent of the world’s megacities (those over 5 million) are located in these coastal areas. A rise in sea level of even a meter would have major implications for coastal populations; if sea levels were to rise by several meters, the consequences would be catastrophic. Most obviously, sea level rise will submerge land, causing countries to lose physical territory. The areas expected to experience the largest land loss by 2030 are the Arctic Ocean coasts of Canada, Alaska, Siberia and Greenland as well as coastal areas of Pakistan, Sri Lanka, southeast Indonesia, and eastern Africa. In the United States, particularly vulnerable areas include the coastal areas of the east and west coasts and the Gulf of Mexico. Rising sea levels will affect economics, politics, community life and security. For example, the mega-deltas of Asia are the food baskets of the region, and the impact of a sea level rise on food security will be considerable. But perhaps the most significant impact of climate change in general and rising sea levels in particular will be the displacement of people. Migration is a complex process driven by a range of economic, social and political factors but it is becoming clear that environmental factors will increasingly influence migration. In Bangladesh, for example, moving to cities has become a common coping strategy in the face of flooding. One of the IPCC background studies posits that a 40-centimeter rise in sea levels will affect 100 million people. As hundreds of millions of people in Africa and Asia are at risk of flooding by 2060, it is likely that many will move to cities such as Dhaka and Lagos that are located in coastal flood plain areas. In other words, the trend is for people to migrate to areas of greater — not lesser — environmental vulnerability. At the same time, as the UK’s authoritative Foresight study concludes, those who are able to migrate may well be the lucky ones; those who are unable to move may be the most vulnerable. Large-scale migration has many consequences. If sea level rise renders small island states uninhabitable (which is likely to occur long before the islands are actually submerged by the seas), issues of sovereignty, legal status, and responsibility will present the world with huge challenges. Most climate change-induced or displacement will be internal, placing strain on infrastructure and pressure on governments to deliver services. Political instability, conflict poor governance exacerbate these problems. Climate change is a threat multiplier, often affecting those countries least able to respond appropriately. How will governments cope with the movement of large numbers of people from coasts toward inland areas? There is also a possibility that some, perhaps many, will seek to move to other countries because of the effects of climate change. The international legal system is unprepared to deal with trans-border movements triggered by environmental factors or disasters, since the displaced do not fall under the 1951 Refugee Convention (unless they leave because of political turmoil exacerbated by climate change.) Projecting possible massive displacement from climate change is complicated by the difficulty of comprehending the interrelationships between the different effects of climate change, for example, changes in fish stocks and coral reefs brought about by the acidification of the world’s oceans; changing patterns of disease; changing habitats for animals and plants; the intersection of deforestation and increasingly arid climates in some parts of the world. Delicate ecological balances are changing in ways that are as yet poorly understood. Similarly, there is much we do not know about the dynamic nature of the effects of climate change. For example, some scientists are reporting that the melting of Arctic ice itself is releasing more carbon into the atmosphere, increasing global warming which will in turn increase the rate of Arctic ice melt. Most scientists have observed that the climate is becoming warmer and that extreme weather events are becoming more frequent. While it is impossible to attribute any single weather event, such as Hurricane Sandy, to climate change, the global trends clearly demonstrate an increase in the frequency of extreme weather events. These trends are likely to intensify. The interaction between increasing extreme weather events and other effects of climate change – such as increased erosion, acidification of the seas, desertification, sea-level rise – is also likely to lead to large-scale movement of people. Conclusion: There are certainly obstacles and pitfalls to making climate change a centerpiece of your foreign policy. Perhaps the projections of scientists are too pessimistic and the effects of global warming will not be as serious as now thought. Perhaps you will be unable to marshal the necessary political support to enact necessary legislation. Perhaps other governments will fail to rally to your leadership and perhaps the negotiations over climate change mitigation and adaptation will widen, not narrow the North- South divide. It is certainly understandable that you would want to put aside these longer-term challenges and focus on more immediate economic issues. But a climate catastrophe could be lurking around the corner. **Unless urgent action is taken now**, the effects of climate change on life on this planet and on life in the United States will increase. Climate change is a domestic, foreign policy, security, development, human rights, and intergenerational justice issue. Preparing better for climate change disasters at home and abroad is a good short-term prophylactic. But making serious and sustained efforts to reduce global warming **can solidify** America’s present leadership in the world. It can lay the foundation for the country’s sustainable future development. It can address the causes of future humanitarian crises and alleviate future human suffering. It can be a legacy issue for the Obama administration that will impact the world for generations.

#### Causes extinction – oceans

**Sify 2010 –** Sydney newspaper citing Ove Hoegh-Guldberg, professor at University of Queensland and Director of the Global Change Institute, and John Bruno, associate professor of Marine Science at UNC (Sify News, “Could unbridled climate changes lead to human extinction?”, <http://www.sify.com/news/could-unbridled-climate-changes-lead-to-human-extinction-news-international-kgtrOhdaahc.html>, WEA)

The findings of the comprehensive report: 'The impact of climate change on the world's marine ecosystems' emerged from a synthesis of recent research on the world's oceans, carried out by two of the world's leading marine scientists. One of the authors of the report is Ove Hoegh-Guldberg, professor at The University of Queensland and the director of its Global Change Institute (GCI). 'We may see sudden, unexpected changes that have serious ramifications for the overall well-being of humans, including the capacity of the planet to support people. This is further evidence that we are well on the way to the next great extinction event,' says Hoegh-Guldberg. 'The findings have enormous implications for mankind, particularly if the trend continues. The earth's ocean, which produces half of the oxygen we breathe and absorbs 30 per cent of human-generated carbon dioxide, is equivalent to its heart and lungs. This study shows worrying signs of ill-health. It's as if the earth has been smoking two packs of cigarettes a day!,' he added. 'We are entering a period in which the ocean services upon which humanity depends are undergoing massive change and in some cases beginning to fail', he added. The 'fundamental and comprehensive' changes to marine life identified in the report include rapidly warming and acidifying oceans, changes in water circulation and expansion of dead zones within the ocean depths. These are driving major changes in marine ecosystems: less abundant coral reefs, sea grasses and mangroves (important fish nurseries); fewer, smaller fish; a breakdown in food chains; changes in the distribution of marine life; and more frequent diseases and pests among marine organisms. Study co-author John F Bruno, associate professor in marine science at The University of North Carolina, says greenhouse gas emissions are modifying many physical and geochemical aspects of the planet's oceans, in ways 'unprecedented in nearly a million years'. 'This is causing fundamental and comprehensive changes to the way marine ecosystems function,' Bruno warned, according to a GCI release. These findings were published in Science

#### The IFR is the only way to reduce coal emissions sufficiently to avert the worst climate disasters

**Kirsch 9** (Steve Kirsch, Bachelor of Science and a Master of Science in electrical engineering and computer science from the Massachusetts Institute of Technology, American serial entrepreneur who has started six companies: Mouse Systems, Frame Technology, Infoseek, Propel, Abaca, and OneID, "Why We Should Build an Integral Fast Reactor Now," 11/25/9) http://skirsch.wordpress.com/2009/11/25/ifr/

To prevent a climate disaster, we must eliminate virtually all coal plant emissions worldwide in 25 years. The best way and, for all practical purposes, the only way to get all countries off of coal is not with coercion; it is to make them want to replace their coal burners by giving them a plug-compatible technology that is less expensive. The IFR can do this. It is plug-compatible with the burners in a coal plant (see Nuclear Power: Going Fast). No other technology can upgrade a coal plant so it is greenhouse gas free while reducing operating costs at the same time. In fact, no other technology can achieve either of these goals. The IFR can achieve both.¶ The bottom line is that without the IFR (or a yet-to-be-invented technology with similar ability to replace the coal burner with a cheaper alternative), it is unlikely that we’ll be able to keep CO2 under 450 ppm.¶ Today, the IFR is the only technology with the potential to displace the coal burner. That is why restarting the IFR is so critical and why Jim Hansen has listed it as one of the top five things we must do to avert a climate disaster.[4]¶ Without eliminating virtually all coal emissions by 2030, the sum total of all of our other climate mitigation efforts will be inconsequential. Hansen often refers to the near complete phase-out of carbon emissions from coal plants worldwide by 2030 as the sine qua non for climate stabilization (see for example, the top of page 6 in his August 4, 2008 trip report).¶ To stay under 450ppm, we would have to install about 13,000 GWe of new carbon-free power over the next 25 years. That number was calculated by Nathan Lewis of Caltech for the Atlantic, but others such as Saul Griffith have independently derived a very similar number and White House Science Advisor John Holdren used 5,600 GWe to 7,200 GWe in his presentation to the Energy Bar Association Annual Meeting on April 23, 2009. That means that if we want to save the planet, we must install more than 1 GWe per day of clean power every single day for the next 25 years. That is a very, very tough goal. It is equivalent to building one large nuclear reactor per day, or 1,500 huge wind turbines per day, or 80,000 37 foot diameter solar dishes covering 100 square miles every day, or some linear combination of these or other carbon free power generation technologies. Note that the required rate is actually higher than this because Hansen and Rajendra Pachauri, the chair of the IPCC, now both agree that 350ppm is a more realistic “not to exceed” number (and we’ve already exceeded it).¶ Today, we are nowhere close to that installation rate with renewables alone. For example, in 2008, the average power delivered by solar worldwide was only 2 GWe (which is to be distinguished from the peak solar capacity of 13.4GWe). That is why every renewable expert at the 2009 Aspen Institute Environment Forum agreed that nuclear must be part of the solution. Al Gore also acknowledges that nuclear must play an important role.¶ Nuclear has always been the world’s largest source of carbon free power. In the US, for example, even though we haven’t built a new nuclear plant in the US for 30 years, nuclear still supplies 70% of our clean power!¶ Nuclear can be installed very rapidly; much more rapidly than renewables. For example, about two thirds of the currently operating 440 reactors around the world came online during a 10 year period between 1980 and 1990. So our best chance of meeting the required installation of new power goal and saving the planet is with an aggressive nuclear program.¶ Unlike renewables, nuclear generates base load power, reliably, regardless of weather. Nuclear also uses very little land area. It does not require the installation of new power lines since it can be installed where the power is needed. However, even with a very aggressive plan involving nuclear, it will still be extremely difficult to install clean power fast enough.¶ Unfortunately, even in the US, we have no plan to install the clean power we need fast enough to save the planet. Even if every country were to agree tomorrow to completely eliminate their coal plant emissions by 2030, how do we think they are actually going to achieve that? There is no White House plan that explains this. There is no DOE plan. There is no plan or strategy. The deadlines will come and go and most countries will profusely apologize for not meeting their goals, just like we have with most of the signers of the Kyoto Protocol today. Apologies are nice, but they will not restore the environment.¶ We need a strategy that is believable, practical, and affordable for countries to adopt. The IFR offers our best hope of being a centerpiece in such a strategy because it the only technology we know of that can provide an economically compelling reason to change.¶ At a speech at MIT on October 23, 2009, President Obama said “And that’s why the world is now engaged in a peaceful competition to determine the technologies that will power the 21st century. … The nation that wins this competition will be the nation that leads the global economy. I am convinced of that. And I want America to be that nation, it’s that simple.”¶ Nuclear is our best clean power technology and the IFR is our best nuclear technology. The Gen IV International Forum (GIF) did a study in 2001-2002 of 19 different reactor designs on 15 different criteria and 24 metrics. The IFR ranked #1 overall. Over 242 experts from around the world participated in the study. It was the most comprehensive evaluation of competitive nuclear designs ever done. Top DOE nuclear management ignored the study because it didn’t endorse the design the Bush administration wanted.¶ The IFR has been sitting on the shelf for 15 years and the DOE currently has no plans to change that.¶ How does the US expect to be a leader in clean energy by ignoring our best nuclear technology? Nobody I’ve talked to has been able to answer that question.¶ We have the technology (it was running for 30 years before we were ordered to tear it down). And we have the money: The Recovery Act has $80 billion dollars. Why aren’t we building a demo plant?¶ IFRs are better than conventional nuclear in every dimension. Here are a few:¶ Efficiency: IFRs are over 100 times more efficient than conventional nuclear. It extracts nearly 100% of the energy from nuclear material. Today’s nuclear reactors extract less than 1%. So you need only 1 ton of actinides each year to feed an IFR (we can use existing nuclear waste for this), whereas you need 100 tons of freshly mined uranium each year to extract enough material to feed a conventional nuclear plant.¶ Unlimited power forever: IFRs can use virtually any actinide for fuel. Fast reactors with reprocessing are so efficient that even if we restrict ourselves to just our existing uranium resources, we can power the entire planet forever (the Sun will consume the Earth before we run out of material to fuel fast reactors). If we limited ourselves to using just our DU “waste” currently in storage, then using the IFR we can power the US for over 1,500 years without doing any new mining of uranium.[5]¶ Exploits our largest energy resource: In the US, there is 10 times as much energy in the depleted uranium (DU) that is just sitting there as there is coal in the ground. This DU waste is our largest natural energy resource…but only if we have fast reactors. Otherwise, it is just waste. With fast reactors, virtually all our nuclear waste (from nuclear power plants, leftover from enrichment, and from decommissioned nuclear weapons)[6] becomes an energy asset worth about $30 trillion dollars…that’s not a typo…$30 trillion, not billion.[7] An 11 year old child was able to determine this from publicly available information in 2004.

#### Inventing something cheaper is key – alternative methods can’t solve warming

**Kirsch 9** (Steve Kirsch, Bachelor of Science and a Master of Science in electrical engineering and computer science from the Massachusetts Institute of Technology, American serial entrepreneur who has started six companies: Mouse Systems, Frame Technology, Infoseek, Propel, Abaca, and OneID, "How Does Obama Expect to Solve the Climate Crisis Without a Plan?" 7/16/9) [http://www.huffingtonpost.com/steve-kirsch/how-does-obama-expect-to\_b\_236588.html-http://www.huffingtonpost.com/steve-kirsch/how-does-obama-expect-to\_b\_236588.html](http://www.huffingtonpost.com/steve-kirsch/how-does-obama-expect-to_b_236588.html-http%3A//www.huffingtonpost.com/steve-kirsch/how-does-obama-expect-to_b_236588.html)

The ship is sinking slowly and we are quickly running out of time to develop and implement any such plan if we are to have any hope of saving the planet. What we need is a plan we can all believe in. A plan where our country's smartest people all nod their heads in agreement and say, "Yes, this is a solid, viable plan for keeping CO2 levels from touching 425ppm and averting a global climate catastrophe."¶ ¶ At his Senate testimony a few days ago, noted climate scientist James Hansen made it crystal clear once again that the only way to avert an irreversible climate meltdown and save the planet is to phase out virtually all coal plants worldwide over a 20 year period from 2010 to 2030. Indeed, if we don't virtually eliminate the use of coal worldwide, everything else we do will be as effective as re-arranging deck chairs on the Titanic.¶ ¶ Plans that won't work¶ ¶ Unfortunately, nobody has proposed a realistic and practical plan to eliminate coal use worldwide or anywhere close to that. There is no White House URL with such a plan. No environmental group has a workable plan either.¶ ¶ Hoping that everyone will abandon their coal plants and replace them with a renewable power mix isn't a viable strategy -- we've proven that in the U.S. Heck, even if the Waxman-Markey bill passes Congress (a big "if"), it is so weak that it won't do much at all to eliminate coal plants. So even though we have Democrats controlling all three branches of government, it is almost impossible to get even a weak climate bill passed.¶ ¶ If we can't pass strong climate legislation in the U.S. with all the stars aligned, how can we expect anyone else to do it? So expecting all countries to pass a 100% renewable portfolio standard (which is far far beyond that contemplated in the current energy bill) just isn't possible. Secondly, even if you could mandate it politically in every country, from a practical standpoint, you'd never be able to implement it in time. And there are lots of experts in this country, including Secretary Chu, who say it's impossible without nuclear (a point which I am strongly in agreement with).¶ ¶ Hoping that everyone will spontaneously adopt carbon capture and sequestration (CCS) is also a non-starter solution. First of all, CCS doesn't exist at commercial scale. Secondly, even if we could make it work at scale, and even it could be magically retrofitted on every coal plant (which we don't know how to do), it would require all countries to agree to add about 30% in extra cost for no perceivable benefit. At the recent G8 conference, India and China have made it clear yet again that they aren't going to agree to emission goals.¶ ¶ Saying that we'll invent some magical new technology that will rescue us at the last minute is a bad solution. That's at best a poor contingency plan.¶ ¶ The point is this: It should be apparent to us that we aren't going to be able to solve the climate crisis by either "force" (economic coercion or legislation) or by international agreement. And relying on technologies like CCS that may never work is a really bad idea.¶ ¶ The only remaining way to solve the crisis is to make it economically irresistible for countries to "do the right thing." The best way to do that is to give the world a way to generate electric power that is economically more attractive than coal with the same benefits as coal (compact power plants, 24x7 generation, can be sited almost anywhere, etc). Even better is if the new technology can simply replace the existing burner in a coal plant. That way, they'll want to switch. No coercion is required.

### 3

#### Euro-American nuclear collaboration now – but US funding shortfalls block its effectiveness

**Lovering, Luke, and Brook 12** [Jessica Lovering is a policy analyst, and Max Luke is a policy associate, in the Breakthrough Institute’s Energy & Climate program. Barry Brook is a Breakthrough Senior Fellow, November 16, 2012, “How U.S.-European Cooperation Can Deliver Cheaper, Safer Nuclear Energy”, Breakthrough Institute]

As the debate over climate policy picks up again in the wake of Hurricane Sandy and President Obama’s reelection, policymakers should prioritize efforts that will accelerate the adoption of zero-carbon technologies, especially the only proven baseload source available: next generation nuclear.¶ Whereas traditional nuclear reactors from the 1950s were designed in secret, advanced models are being researched, designed, and financed by innovative international collaborations. Take GE-Hitachi's PRISM, a joint American-Japanese venture to construct a power plant in the United Kingdom capable of processing plutonium. Or the recent announcement that South Korea's national electric utility, KEPCO, had been awarded a contract to build the first nuclear plant in the United Arab Emirates, using Australian-mined uranium for fuel.¶ An expanding international community recognizes the importance of developing advanced nuclear reactor designs to meet energy needs and address global warming. Thirteen countries have joined the Generation IV International Forum (GIF), for instance, a cooperative endeavor to encourage governments and industry to support advanced nuclear energy concepts. Member countries, which include the United States, Japan, Russia, and China, have agreed to expand R&D funding for advanced nuclear projects that meet stringent sustainability, economic, safety and nonproliferation goals.¶ Yet despite international agreement on the necessity of next generation nuclear systems, there is a dearth of support at the national level. In the US, annual federal RD&D spending for advanced fission reactors has not exceeded $200 million in the last 10 years, following much larger budgets through the 1970s to mid-1990s. The majority of research and investment in advanced nuclear systems today comes from Asia, and most new nuclear is constructed in developing nations. Yet many of the countries most interested in building more nuclear are largely stuck with old Generation II designs.¶ Private industry appears ready to take a leadership role in the development and deployment of advanced nuclear builds, but the right government incentives, international agreements and support structures must be in place for this to occur. GE-Hitachi, for example, submitted a proposal last year to build a pair of next generation modular fast reactors in the UK, the first commercial advanced nuclear plant. These “PRISM” reactors are based on an Integral Fast Reactor (IFR) design that is widely considered one of the most promising next generation models (see this white paper by Breakthrough Senior Fellow Barry Brook and Tom Blees of the Science Council for Global Initiatives). In addition to providing clean electricity, PRISM reactors would burn weapons material, offering a cost-effective solution to the UK’s plutonium disposal problem. If built, the reactors would be able to process all of the UK’s stockpiled plutonium within five years and then generate decades of clean energy, in addition to providing a full commercial demonstration of the technology. Other European countries and the United States should seek out and support these win-win scenarios, where an advanced clean technology can be demonstrated while also solving a separate policy problem.

#### Effective collaboration ends European coal dependence

**Lynas 11** [European Dialogue, “WHY NUCLEAR POWER IS STILL A GOOD CHOICE”, April 18, 2011, Mark Lynas, a British author, journalist and environmental activist who focuses on climate change, contributor to New Statesman, Ecologist, Granta and Geographical magazines, and The Guardian and The Observer, degree in history and politics from the University of Edinburgh]

They can. The irony of Fukushima is that in forcing us all to confront our deepest fears about the dangers of nuclear power, we find many of them to be wildly irrational — based on scare stories propagated through years of unchallenged mythology and the repeated exaggerations of self-proclaimed "experts" in the anti-nuclear movement. As the British environmental writer George Monbiot has pointed out, if we took the scientific consensus on nuclear energy as seriously as we take the scientific consensus on climate change, we environmentalists would be telling a very different story.¶ The science on radiation tells us that the effects of Fukushima are serious but so far much less so than some of the more hyperbolic media coverage might suggest. The power plant operator, Tokyo Electric Power Co., has been releasing enormous quantities of radioactive water into the sea, for example. It sounds scary, but a member of the public would have to eat seaweed and seafood harvested just one mile from the discharge pipe for a year to receive an effective dose of 0.6 millisieverts. To put this in context, every American receives on average 3 millisieverts each year from natural background radiation, and a hundred times more than this in some naturally radioactive areas. As for the Tokyo tap water that was declared unsafe for babies, the highest measured levels of radioactivity were 210 becquerels per liter, less than a quarter of the European legal limit of 1,000 becquerels per liter. Those leaving Tokyo because of this threat will have received more radiation on the airplane flight out than if they had been more rational and stayed put.¶ For the green movement, which is often justifiably accused of making the perfect the enemy of the good, having to confront real-world choices about energy technologies is painful. Most environmentalists assert that a combination of renewables and efficiency can decarbonize our energy supply and save us both from global warming and the presumed dangers of nuclear power. This is technically possible but extremely unlikely in practice. In the messy real world, countries that decide to rely less on nuclear will almost certainly dig themselves even deeper into a dependence on dirty fossil fuels, especially coal.¶ In the short term, this is already happening. In Germany — whose government tried to curry favor with a strongly anti-nuclear population by rashly closing seven perfectly safe nuclear plants after the Fukushima crisis began — coal has already become the dominant factor in electricity prices once again. Regarding carbon dioxide emissions, you can do the math: Just add about 11 million tons per year for each nuclear plant replaced by a coal plant newly built or brought back onto the grid.¶ In China the numbers become even starker. Coal is cheap there (as are the thousands of human lives lost in extracting it each year), and if the hundred or so new nuclear plants previously proposed in China up to 2030 are not built, it is a fair bet that more than a billion tons can be added to annual global carbon dioxide emissions as a result.¶ Japan is also heavily dependent on coal, so it is a fair bet that less nuclear power there will add substantially to the country's emissions. No wonder the Japanese are insisting on backing off from the Kyoto climate treaty. Looking at the entire global picture, I estimate that turning away from nuclear power could make the difference between whether the world warms by 2 degrees Celsius (bad but manageable) and 3 degrees Celsius (disastrous) in the next century.¶ We have already made this mistake once. In the 1970s it looked as if nuclear power was going to play a much bigger role than eventually turned out to be the case. What happened was Three Mile Island, and the birth of an anti-nuclear movement that stopped dozens of half-built or proposed reactors; coal plants were substituted instead. It is therefore fair to say that the environmental movement played a substantial role in causing global warming, surely an ecological error it should learn from in years ahead.¶ Don't get me wrong: I am an enthusiastic proponent of replacing fossil fuels with renewable energy sources. I strongly support wind, solar and other clean-tech options. But all energy technologies come with an ecological price tag. Wind turbines kill and injure birds and bats. Solar thermal plants proposed in the Mojave Desert have conservationists up in arms. If we are serious about taking biodiversity into consideration as well as climate change, these concerns cannot be idly dismissed. In terms of land use, nuclear scores very well, because the comparatively small quantities of fuel required means less land disturbed or ruined by mines, processing and related uses.¶ Take Japan again. According to some recent number crunching by the Breakthrough Institute, a centrist environmental think tank, phasing out Japan's current nuclear generation capacity and replacing it with wind would require a 1.3-billion-acre wind farm, covering more than half the country's total land mass. Going for solar instead would require a similar land area, and would in economic terms cost the country more than a trillion dollars.¶ Those debating the future of nuclear power also tend to focus on out-of-date technology. No one proposes to build boiling-water reactors of 1960s-era Fukushima vintage in the 21st century. Newer designs have a much greater reliance on passive safety, as well as a host of other improvements. Fourth-generation options, such as the "integral fast reactor" reportedly being considered by Russia, could be even better. Fast-breeders like the IFR will allow us to power whole countries cleanly by burning existing stockpiles of nuclear waste, depleted uranium and military-issue plutonium. And the waste left over at the end would become safe after a mere 300 years, so no Yucca Mountains needed there. IFRs exist only on paper, however; we need to urgently research prototypes before moving on to large-scale deployment.¶ What is needed is perspective. Nuclear energy is not entirely safe, as Fukushima clearly shows, even if the current radiation-related death toll is zero and will likely remain so. But coal and other fossil fuels are far, far worse. And insisting only on renewables risks worsening global warming as an unintended consequence. We need a portfolio of clean energy technologies, deployed in the most environmentally responsible way. Above all, let us base our energy policy on a scientifically valid appreciation of real-world risk, and not on scare stories from the past.

#### S-PRISM key to end coal – modularity and plug-compatibility

**Salmon 9** [Reuters, “Nuclear power: Going fast”, Felix Salmon, finance editor for Reuters, graduate of University of Glasgow, winner of 2010 Excellence in Statistical Reporting Award presented by the American Statistical Association, over a decade of financial reporting experience, JUNE 23, 2009]

I was offline most of yesterday attending a high-intensity series of presentations hosted by Esquire magazine in the magnificent suite of rooms at the top of the new Hearst tower. GE’s Eric Loewen was there, talking about nuclear power, and specifically what he calls a PRISM reactor — a fourth-generation nuclear power station which runs on the nuclear waste generated by all the previous generations of nuclear power stations.¶ PRISM is GE’s name for an integral fast reactor, or IFR, and it’s a pretty great technology. The amount of fuel which already exists for such reactors would be enough to power the world for millennia — no new mining needed. Fast reactors also solve at a stroke the problem of what to do with the vast amounts of nuclear waste which are being stockpiled unhappily around the world. They’re super-safe: if they fail they just stop working, they don’t melt down. And they can even literally replace coal power stations:¶ One nice thing about the S-PRISM is that they’re modular units and of relatively low output (one power block of two will provide 760 MW). They could be emplaced in excavations at existing coal plants and utilize the same turbines, condensers (towers or others), and grid infrastructure as the coal plants currently use, and the proper number of reactor vessels could be used to match the capabilities of those facilities. Essentially all you’d be replacing is the burner (and you’d have to build a new control room, of course, or drastically modify the current one). Thus you avoid most of the stranded costs. If stranded costs can thus be kept to a minimum, both here and, more importantly, in China, we’ll be able to talk realistically not just about stopping to build new coal plants but replacing the existing ones, even the newest ones.¶ And best of all they’re eminently affordable: Loewen showed that they could be profitable selling energy at just 5 cents per KwH — which means that you don’t need to price carbon emissions at all to make these power stations economically attractive.

#### Otherwise, coal exports to Europe are inevitable

**Stafford 12** [“Obama's Nuclear Power Plans”, James Stafford, editor, oilprice.org, 23 November 2012]

While nuclear is experiencing a bit of a revival in the US and coal languishes in its death throes, globally, coal is enjoying gains. Some 1,200 new coal plants are in the works worldwide—the bulk of them in China and India—as countries take advantage of cheap coal prices in the US. But even Europe is importing increasing amounts of coal from the US. US coal exports have reached a decade high.¶ For Europe, this is troubling. As the European public puts increasing pressure on governments to abandon any dreams of fracking shale gas reserves over environmental concerns, the energy gap is being filled in by more polluting coal. This is the subject of our special investor piece today. There is good news—and bad. While the European Parliament has rejected a fracking ban proposal, this doesn’t mean we’re about to see a shale gas free-for-all. Hurdles and pitfalls abound.

#### European coal reliance kills successful European cap and trade

**Martin 12** [7/13/2012, “In Europe, Coal Regains Its Crown”, Richard Martin, Contributor, Forbes Magazine]

Indirectly, the rush to coal is being driven by Germany’s decision to phase out nuclear power in the wake of the 2011 nuclear accident at Fukushima, Japan. Exactly how Germany – which has been a major coal power since the mid-18th century – will replace generation from nuclear plants remains uncertain, but clearly, for now, coal is the answer. Stating that “fossil fuel-fired power plants are essential for a secure energy supply,” a 2011 study from the Economics Ministry in Berlin called for the construction of around 17 major new power plants by 2022. If some of those turn out to be coal-fired plants it will signal a major setback for Europe’s plans for a carbon-free electrical sector and the failure of the EU carbon trading scheme.¶ “The continent-wide cap-and-trade regime in operation in Europe continues to disappoint, as nations switch back to dirty coal-fired electricity generation,” wrote Alex Trembath in a July 9 analysis for The Breakthrough Institute. Meanwhile the EIA reported that for the first time since the government began compiling monthly statistics, the share of power generation from natural gas in the United States matched that of coal, each accounting for 32% of total generation. The shift to natural gas is powering significant reductions in the emission of greenhouse gases in the U.S.¶ “CO2 emissions in the United States in 2011 fell by 92 Mt (million tonnes), or 1.7%, primarily due to ongoing switching from coal to natural gas in power generation and an exceptionally mild winter, which reduced the demand for space heating,” stated the International Energy Agency.¶ Despite the most progressive anti-carbon regulations in the world, Europe, unfortunately, is headed in the opposite direction.

#### That’s key to EU integration and growth

**Centre for European Reform 11** [“GREEN, SAFE, CHEAP: Where next for EU energy policy?, Christof van Agt is senior researcher for the international energy¶ programme at the Netherlands Institute of International Relations¶ (Clingendael) in The Hague, ¶ Václav Bartuška is ambassador at large for energy security for the¶ Czech Republic, ¶ Katinka Barysch is deputy director of the Centre for European¶ Reform (CER) in London, ¶ Jonathan Gaventa is senoir policy advisor at E3G (Third Generation¶ Environmentalism), a non-proﬁt organisation dedicated to¶ accelerating the transition to sustainable development. ¶ Connie Hedegaard is the commissioner for climate action at the¶ European Commission in Brussels, ¶ Dieter Helm, Nick¶ Mabey, Günther Oettinger, Pernille Schiellerup, ¶ Stephen Tindale, Frank Umbach and Georg¶ Zachmann. Edited by Katinka Barysch, September 2011]

Out of the weak foundations created by the internal energy market¶ and the climate change package, the shape of a much better¶ European energy policy is beginning to emerge. The Commission is¶ ﬁnally taking infrastructure seriously. Properly shaped and managed¶ in a pragmatic way, this has the prospect of being a thoroughly¶ European project – a European grid, reducing the costs to all¶ Europeans, and one which further integrates the peripheral memberstates that can beneﬁt from the European security it would provide. ¶ A focus on infrastructure would improve competitiveness and allow¶ the new technologies to help address the climate change challenge.¶ 18 Green, safe, cheap¶ Smart grids, smart meters and electric cars have all the makings of¶ an energy transformation.¶ To translate these ideas into concrete proposals, the Commission¶ needs to do several things. The ﬁrst is to come up with detailed¶ delivery plans for implementing the existing policies on infrastructure.¶ The second is to force through greater integration of the national and¶ regional system operators. The third is to co-ordinate an innovation¶ agenda around smart technologies, by co-ordinating research,¶ bringing the communications and energy industries together and¶ promoting a necessary element of standardisation.¶ These practical steps will in the process help to make the internal¶ energy market a reality, and to reduce the costs of achieving the¶ climate change package. Better still, a reconsideration of the¶ renewables directive with a view to making greater emissions cuts at¶ lower costs, rather than focusing on a short-term dash for wind,¶ would be better for growth, competitiveness and the climate.

#### That prevents war and Eurozone collapse

**Roubini and** Berggruen 2011 - Nouriel Roubini is professor of economics at New York University's Stern School of Business and is the co-founder of RGE Monitor, an innovative economic and geo-strategic information service. He served as a senior adviser to the White House council of economic advisers and the US Treasury, Nicolas Berggruen is the founder and president of Berggruen Holdings, a private investment company, and the Nicolas Berggruen Institute, a political thinktank whose projects include the Council for the Future of Europe (Stop dithering. Only full integration can save Europe, The Guardian, September 7, 2011, <http://www.guardian.co.uk/commentisfree/2011/sep/07/only-full-integration-save-europe>, MCL)

After many months of muddling through – but not getting at the systemic roots of the economic, fiscal and financial crisis – Europe is at the tipping point. If it continues any longer with the status quo of dithering instead of decisiveness, the eurozone will break up and its national economies will weaken. Only by moving forward towards full integration – now – can Europe save itself. So far, as the former Spanish prime minister Felipe González has put it, Europe's leaders have been "acting as fireman", putting out one fire after the next but not putting in place a system to prevent the next outbreak. Extend and pretend; pray and delay; kick the can down the street. These are not real and stable solutions but futile Band-Aids. Along with persistent partisan gridlock and the clear slippage of the recovery in the US, Europe's crisis of governance is dragging down the entire global economy. Stall speed is yielding to contraction and double-dip risk. It is by now clear that short-term financial stability in Europe can only be purchased with a credible long-term strategy to complete a political and fiscal union. The incoming head of the European Central Bank, Mario Draghi, has rightly argued that Europe urgently needs to "make a quantum step up in economic and political integration". How do we get from here to there? Clear steps, some outlined this week by the Council for the Future of Europe, include the following. In the short-term further market contagion needs to be avoided. Rapid implementation of July's decision to allow the established stabilisation mechanisms to intervene is of critical importance. In addition, the size of these mechanisms must be expanded to avoid a self-fulfilling run on Italian and Spanish debt while their economic policies take time to restore market confidence. Thus, by 2012 – not 2013, as previously planned – these mechanisms should be transformed into a permanent, fully fledged European fund. Moreover, the eurozone must practically ensure banks are properly capitalised, including through private sector participation. The markets, rightly or wrongly, believe that the capital needs of some banks are larger than the stress tests suggested. Action to restore credibility is necessary. It is now clear that a monetary union without some form of fiscal federalism and co-ordinated economic policy will not work. Nation-states will need to share certain aspects of sovereignty with a central European entity that would have the capacity to source revenue at the federal level in order to provide European-wide public goods. Furthermore, eurobonds should be created with control mechanisms to avoid large fiscal deficits in any given country. The stability and growth pact has proven insufficient. Not only Greece, but the central powers of Europe – Germany and France – have ignored its limits in the past. To protect the public from irresponsible policies by any government, and to give comfort to Germany and other core countries that a fiscal union won't turn out to be a transfer union that puts at risk their own credit rating, the eurozone requires an effective control system. While standards must be strict, the diversity of conditions across the eurozone requires flexibility. Liquidity support via a fund is sometimes warranted, but situations of clear insolvency should not be addressed with bailouts. Mechanisms for orderly debt resolution must be established for both public and private liabilities if lasting and unmanageable insolvencies arise. Greece, which is clearly insolvent, will soon engage in an orderly restructure of its debt via an exchange offer. The same mechanism can be applied to other nations. Additionally, in pursuing the necessary fiscal austerity and structural reforms, we must be careful not to undermine any fragile recovery in the short run. We can't wait years to restore growth, because debt sustainability depends on growth, and because the social and political backlash against austerity may undermine reforms if stagnation persists. Adequate macro-economic policies must be employed to avoid this, including monetary easing by the European Central Bank, a weaker euro to restore competitiveness, and fiscal stimulus in the core countries to compensate for the fiscal drag deriving from austerity in the periphery. We should also recognise that austerity is necessary but not sufficient to restore growth. To compete in the globalised world, Europe needs to implement an ambitious agenda for growth and employment to boost competitiveness and long-term productivity. Such a growth strategy should include use of existing EU funds to finance infrastructure spending and stimulate job creation in the periphery, as well as programmes to enhance research and development, professional skills and higher education. Without growth, the temptation for economic nationalism will arise. One of Europe's key challenges will be a readjustment of the social compact. A social safety net is necessary to allow for labour flexibility when workers need to change jobs and industries over their working lives. But it must face the reality of a fiscal squeeze brought on by the demographic shift to ageing societies. Finally, beyond these more technical steps, the greatest stumbling block to the assured success of Europe is the lack of legitimacy of its institutions. Only stronger institutions can save Europe, but their strength can be enhanced only through greater popular support. Yet that support is being undermined daily by their present ineffectiveness. In this sense, the crisis in Europe today is above all political. Further political integration and union can only be built hand in hand, step by step, through a broad and deep engagement of the public. The democratic deficit deriving from the perception that important decisions are taken by unelected Eurocrats in Brussels needs to be filled by political reforms that empower further the European parliament, and by appropriate forms of democratic oversight of legislative and executive decisions. In short, the greatest task of European leadership today is to re-sell the European idea. They need to remind the public that the absence of war, the freedom of mobility and the rising prosperity they have taken for granted since the end of the cold war has been due to the path toward unity and away from the nationalist demons of the past. To change course now is to put all of that at risk. That is why more European integration, not less, is the only solution.

#### European war will escalate and go nuclear – the US will be drawn in

**Glaser 93** (Charles L., Professor of Public Policy at University of Chicago, International Security, Summer, p. 8-9)

However, although the lack of an imminent Soviet threat eliminates the most obvious danger, U.S. security has not been entirely separated from the future of Western Europe. The ending of the Cold War has brought many benefits, but has not eliminated the possibility of major power war, especially since such a war could grow out of a smaller conflict in the East. And, although nuclear weapons have greatly reduced the threat that a European hegemon would pose to U.S. security, a sound case nevertheless remains that a European war could threaten U.S. security. The United States could be drawn into such a war, even if strict security considerations suggested it should stay out. A major power war could escalate to a nuclear war that, especially if the United States joins, could include attacks against the American homeland. Thus, the United States should not be unconcerned about Europe’s future.

#### EU solves extinction and disease

**Bruton 2002** – former Irish PM, Deputy of the Joint Committee on European Affairs (1/31, John, Irish Times, “The Future of the European Union”, http://www.irishtimes.com/newspaper/special/2002/europe/index.htm)

2.5 As the Laeken Declaration put it, "Europe needs to shoulder its responsibilities in the governance of globalisation" adding that Europe must exercise its power in order "to set globalisation within a moral framework, in other words to anchor it in solidarity and sustainable development".

2.6 Only a strong European Union is big enough to create a space, and a stable set of rules, within which all Europeans can live securely, move freely, and provide for themselves, for their families and for their old age. Individual states are too small to do that on their own. Only a strong European Union is big enough to deal with the globalised human diseases, such as AIDS and tuberculosis. Only a strong European Union is big enough to deal with globalised criminal conspiracies, like the Mafia, that threaten the security of all Europeans. Only a strong European Union is big enough to deal with globalised environmental threats, such as global warming, which threaten our continent and generations of its future inhabitants. Only a strong European Union is big enough to deal with globalised economic forces, which could spread recession from one country to another and destroy millions of jobs. Only a strong European Union is big enough to regulate, in the interests of society as a whole, the activities of profit seeking private corporations, some of which now have more spending power than many individual states.

2.7 These tasks are too large for individual states.

2.8 Only by coming together in the European Union can we ensure that humanity, and the values which make us, as individuals, truly human, prevail over blind global forces that will otherwise overwhelm us.

#### Diseases spread causes extinction

**Trucksess, 03** [Chris – Swarthmore College of Environmental Population growth requires technological improvements to maintain quality of life" Studies, “Population growth requires technological improvements to maintain quality of life”] <http://fubini.swarthmore.edu/~ENVS2/S2003/ctrucks1/essay04.html>

A virus can only spread if it can find someone else to infect before it kills the carrier. A fatal disease that leads to death after a long period of time increases the chance that the carrier can infect other people, in turn bringing population closer to extinction. In terms of transportation, if people and goods in the world are too well connected, then a fatal disease that has the potential to lead to extinction would be able to infect many people over large area since the disease can spread quickly over trade routes. The World Health Organization has found that the current spread of Severe Acute Respiratory Syndrome or SARS is facilitated by international travel and can quickly infect many people around the world. Originating in Southeast Asia, speedy transportation has turned SARS from a regional problem into an international issue (World Health Organization, 2003). To avoid the risk of mass deaths due to rapidly spreading diseases, international policymakers need to avoid the creation of a level of world interconnectedness that is too quick. A slightly disconnected world may mean goods may not reach all places where in demand, but the risk of fatal diseases affecting large regions of population would be less. The ideal model of resource distribution is to have necessities be located near areas of population. Localized resources would reduce the need for goods to travel long distances over a lengthened period of time to avoid the spread of disease. Increased levels of population could live well off of added amounts of food that are nearby. This best case of locating populations near resources would be difficult to obtain in practice as resources and populations are already in fixed locations. If people were unwilling to move near where food is available it would be difficult, except in times of war and famine, to force them to relocate. A compromise solution would accept the fact that not all people of the world will be able to have a high standard of living but the potential for improved quality exists. This potential cannot be reached immediately since resources and population remain geographically separate and faster transportation would increase the spread of fatal diseases. Improvements in resource production such as increased crop yields makes it possible to support higher populations and improve the quality of life at least at a local level.

#### Eurozone collapse causes US-China trade war

**Reuters 11** (5-20, “Euro Woes Increase Risk of Trade Wars”, http://blogs.reuters.com/great-debate/2010/05/20/euro-woes-increase-risk-of-trade-wars/)

Europe won’t just be exporting deflation to the rest of the world, it will export serious trade tensions as well: first between the United States and China, and, possibly, eventually between Europe and the United States. The austerity required to get Greece and other weak euro zone nations’ budgets in shape will exert a powerful deflationary force, as many countries which formerly imported more than they exported will be forced to cut back. As well, the euro has dropped very sharply. Germany’s quixotic campaign against speculators — banning naked short selling against government debt and government credit default swaps — gave the euro its latest shove downward, but the trend has been strong for months. The euro is now about 15 percent below where it started the year against the dollar, making U.S. exports less competitive and adding to pressure on the United States to be the world’s foie gras goose: being force-fed everyone else’s exports while its own unemployment rate remains high. That Britain is now embarking on its own round of budget cuts will only make matters worse, adding up to one more important actor trying to consume less and export more courtesy of a devaluing currency. Perhaps the best outcome is rising trade and currency tensions between the United States and China, while at worst this could set the stage for broader conflicts and a round of tit-for-tat tariffs to match similar currency devaluations. Michael Pettis, a professor at Peking University, explains the issue succinctly on his blog, in which he says: “Make no mistake, if southern European trade deficits decline, someone somewhere must bear the brunt of the corresponding adjustment. The only question is who?” The scale of the adjustment is large; taken together Spain, Italy, Portugal and Greece account for about 16 percent of global trade deficits. Add in France, which will surely share some of the pain, and we get up to about 20 percent. You simply cannot have savage recessions and budget cutbacks in these countries without it exerting a powerful force on their trade partners. Clearly the first fault lines will not be across the Atlantic. Talk of the potential for coordinated intervention to support the euro, or at least to make its fall against the dollar a two-way market, attest to the strength of U.S.-European relationships. This is a group that managed the 2007 and 2008 conflagration without ending up at each others’ throats. CHINA MAY BALK AT REVALUATION Pettis points out that within China there is an attitude that the fall in the euro against the dollar, which has made the yuan correspondingly stronger against the euro, is an argument for caution by China in revaluing its currency. Remember too that the European Union comprises China’s largest export market, so it will suffer a double blow, once now by a rising currency and again going forward as Europe adjusts. U.S. Treasury Secretary Timothy Geithner is traveling to Beijing next week to press trade and currency issues. Expectations had been that this would lay the groundwork for some measure of a revaluation of the yuan, which is kept artificially low by the Chinese. The euro zone mess seems to have put paid to that immediate hope. Washington and Geithner are unlikely to want to make already fragile international markets even more so by talking tough next week, but, as the U.S. elections in November near, and, if U.S. unemployment fails to fall, the pressure to take action against China in the form of not just verbal battering but actual tariffs may become too much. I’d note that the U.S. primary elections on Tuesday showed voter anger is focused on incumbents in general and Washington in specific. It would not be a surprise for the administration to try to focus that anger outside the country. So, rising trade tensions with China, but there is also a meaningful chance that tensions will rise eventually between the United States and Europe. Thus far European efforts to address euro zone issues have been disorganized and riven by internal dissension. Germany did not, it appears, consult its partners about its short selling plan. While the European Central Bank’s excellent relationship with the Federal Reserve will help, there is a real chance that the euro suffers a disorganized meltdown and that Europe cannot agree among itself about how, or whether, to stop it. That, especially if combined with Chinese intransigence, could prove to be intolerable for the United States. Trade wars added greatly to the depth and length of the Great Depression. The world’s ability to avoid a similar fight has been one of the blessings of the last two years. Not everyone can export their way back into the black, at least not everyone at the same time. How that is resolved as Europe melts into another recession will be one of the key issues of 2010 and 2011.

#### That spills over into Chinese military conflict

Landy 7 (Ben, Director of Research and Strategy at the Atlantic Media Company, publisher of the Atlantic Monthly, National Journal, and Government Executive magazines April 3, http://chinaredux.com/2007/04/03/protectionism-and-war/#comments)

**The greatest threat for the 21st century** is that these economic flare-ups between the US and China will not be contained, but might spill over into the realm of military aggression between these two world powers**.** Economic conflict breeds military conflict. The **stakes of trade override the ideological power of the Taiwan issue**. China’s ability to continue growing at a rapid rate takes precedence, since there can be no sovereignty for China without economic growth. The United States’ role as the world’s superpower is dependent on its ability to lead economically. As many of you will know from reading this blog, I do not believe that war between the US and China is imminent, or a foregone conclusion in the future. I certainly do not hope for war. But I have little doubt that **protectionist policies** on both sides **greatly increase the likelihood of conflict–far more than increases in military budgets and anti-satellite tests.**

#### The impact is extinction

**Straits Times 2000** (6/25, “No One Gains In War Over Taiwan”, Lexis)

THE DOOMSDAY SCENARIO THE high-intensity scenario postulates a cross-strait war escalating into a full-scale war between the US and China. If Washington were to conclude that splitting China would better serve its national interests, then a full-scale war becomes unavoidable. Conflict on such a scale would embroil other countries far and near and -- horror of horrors -- raise the possibility of a nuclear war. Beijing has already told the US and Japan privately that it considers any country providing bases and logistics support to any US forces attacking China as belligerent parties open to its retaliation. In the region, this means South Korea, Japan, the Philippines and, to a lesser extent, Singapore. If China were to retaliate, east Asia will be set on fire. And the conflagration may not end there as opportunistic powers elsewhere may try to overturn the existing world order. With the US distracted, Russia may seek to redefine Europe's political landscape. The balance of power in the Middle East may be similarly upset by the likes of Iraq. In south Asia, hostilities between India and Pakistan, each armed with its own nuclear arsenal, could enter a new and dangerous phase. Will a full-scale Sino-US war lead to a nuclear war? According to General Matthew Ridgeway, commander of the US Eighth Army which fought against the Chinese in the Korean War, the US had at the time thought of using nuclear weapons against China to save the US from military defeat. In his book The Korean War, a personal account of the military and political aspects of the conflict and its implications on future US foreign policy, Gen Ridgeway said that US was confronted with two choices in Korea -- truce or a broadened war, which could have led to the use of nuclear weapons. If the US had to resort to nuclear weaponry to defeat China long before the latter acquired a similar capability, there is little hope of winning a war against China 50 years later, short of using nuclear weapons. The US estimates that China possesses about 20 nuclear warheads that can destroy major American cities. Beijing also seems prepared to go for the nuclear option. A Chinese military officer disclosed recently that Beijing was considering a review of its "non first use" principle regarding nuclear weapons. Major-General Pan Zhangqiang, president of the military-funded Institute for Strategic Studies, told a gathering at the Woodrow Wilson International Centre for Scholars in Washington that although the government still abided by that principle, there were strong pressures from the military to drop it. He said military leaders considered the use of nuclear weapons mandatory if the country risked dismemberment as a result of foreign intervention. Gen Ridgeway said that should that come to pass, we would see the destruction of civilisation. There would be no victors in such a war. While the prospect of a nuclear Armaggedon over Taiwan might seem inconceivable, it cannot be ruled out entirely, for China puts sovereignty above everything else.

### Plan

#### The United States federal government should provide initial funding for integral fast reactors using the S-PRISM design in the United States.

### Solvency

#### Initial funding solves investor confidence and creates rapid deployment

**Lovering 12** [Jessica Lovering is a policy analyst, and Max Luke is a policy associate, in the Breakthrough Institute’s Energy & Climate program. Barry Brook is a Breakthrough Senior Fellow, November 16, 2012, “How U.S.-European Cooperation Can Deliver Cheaper, Safer Nuclear Energy”, Breakthrough Institute]

Advanced nuclear technologies and small modular reactors (SMRs) are being actively researched and designed, particularly in nations where governments recognize the strategic necessity of nuclear energy in the future energy mix – China, South Korea, United Arab Emirates, and others. Further research is required to understand how governments can best advance next generation nuclear designs, but many of the policies that have helped renewable technologies succeed – federally backed loan guarantees, feed-in tariffs, access to public lands for demonstration projects, and others – show signs of promise.¶ Yet the initial development and deployment of advanced nuclear, which is required to give confidence to commercial utilities to build these at a large scale, is not occurring fast enough. It is time that the United States and European countries recognize advanced nuclear as a potentially crucial component of a clean-energy transition. Without the rapid deployment of nuclear power, our energy needs will probably continue to be met predominately by fossil fuels, and the oft-cited 2°C global warming target will almost certainly not be met.

#### Plan’s mechanism results in successful commercial demonstration

**Kirsch et all 9** [Steve Kirsch, Bachelor of Science and a Master of Science in electrical engineering and computer science from the Massachusetts Institute of Technology, “The Integral Fast Reactor (IFR) project: Q&A”, collaborative attempt to answer questions regarding the integral fast reactor, contribution material, peer editing and review by George Stanford, PhD, a physicist, retired from Argonne National Laboratory, B.Sc. with Honours, Acadia University, M.A.,Wesleyan University, Ph.D. in experimental nuclear physics, Yale University, Tom Blees, Science Council for Global Initiatives, Carl Page, computer science professor at MSU, page last modified 2013]

Q. What's the next step?¶ The commercial demonstration should be a top national priority. A private consortium involving GE might be able to do it as well.¶ Ideally, Congress should fund DOE to have GE build a demonstration plant built. In order to expedite certification and licensing by the NRC, the most expeditious way would be to build a reactor vessel for $50 million, stick it at a university or national lab, and instead of filling it with sodium fill it with water. Build a mockup of the fuel assemblies, also out of non-radioactive material, and use that setup-which would require no licensing-as a prototype to demonstrate to the NRC the efficacy of the systems. For example, the NRC would say, what happens if you drop a fuel assembly when refueling. So you'd go over and run through it with the prototype. Once the thing is certified, you could drain it and use it in an actual power plant, where a single module would produce 380 MWe. They're designed to be built in power blocks of 2 reactor vessels each, feeding one large turbine that would put out 760 MW. You could fire up the first power block as soon as it's ready, even as you build further ones at the same facility. All would share a central control room and recycling facility.

#### That facilitates global expansion of the IFR

**Kirsch et all 9** [Steve Kirsch, Bachelor of Science and a Master of Science in electrical engineering and computer science from the Massachusetts Institute of Technology, “The Integral Fast Reactor (IFR) project: Q&A”, collaborative attempt to answer questions regarding the integral fast reactor, contribution material, peer editing and review by George Stanford, PhD, a physicist, retired from Argonne National Laboratory, B.Sc. with Honours, Acadia University, M.A.,Wesleyan University, Ph.D. in experimental nuclear physics, Yale University, Tom Blees, Science Council for Global Initiatives, Carl Page, computer science professor at MSU, page last modified 2013]

Q. If this is really so good, how come GE isn't building S-PRISM on their own nickel?¶ Nobody wants to risk it since it isn't a slam dunk. You don't get a reward if you solve global warming. And government funding doesn't seem to be so easy. DOE tried to get funding for GNEP (which included IFR technology) and got shot down (so far).¶ GE is a large conservative corporation. They already service a fleet of lightwater reactors, are building more of them around the world, and have the promise of yet more. It's hard enough in this country to move into new levels of reactor technology without trying to leapfrog straight into the 4th generation. Their 3rd generation ESBWR is in the 5th round of NRC certification, whereas the S-PRISM (a souped up and more developed version of the PRISM) isn't at the starting gate. These things take years at the glacial pace of the NRC, though of course if President Obama decided to go all Manhattan project on it we could most definitely get there quickly enough. If GE started pushing 4th generation breeder reactors, can you imagine the hue and cry from the antie groups? What's their incentive to do that? If they're convinced that ultimately we'll end up at 4th generation reactors anyway and they can make plenty of dough and keep a low profile just taking the go slow approach, don't you imagine that's exactly what they'll do? Besides, conceivably another country with whom we have nuclear technology sharing agreements might very well certify and build it before the NRC ever gets out of the starting gate, which would make it much easier for the eventual NRC certification.¶ Q. If this is really so good, how come someone in government isn't trying to get it restarted?¶ The DOE is attempting to resuscitate fast-reactor technology, as part of the GNEP (Global Nuclear Energy Partnership) initiative. See¶ http://www.gnep.energy.gov/gnepPRs/gnepPR011007.html, and http://www.gnep.energy.gov/.¶ The IFR is one form of fast-reactor technology (metallic fuel with pyroprocessing), but there are others -- inferior, according to the IFR scientists. The important thing these days is to get the U.S. back into a leadership role in the development and management of nuclear power, recognizing that recycling in fast reactors is necessary if the long-lived waste is to be consumed, and if the full energy potential of the uranium is to be exploited. The GNEP would resuscitate fast-reactor technology in this country.¶ Q. Critics claim fast reactors are “expensive to build, complex to operate, susceptible to prolonged shutdown as a result of even minor malfunctions, and difficult and time-consuming to repair.”¶ I'm not aware of anyone who is an expert on Integral Fast Reactor technology (who actually really understands the science) who has this view. One Nobel prize winning physicist who was recently briefed on the IFR (Burton Richter, former Director of SLAC) told me that, at best, there is insufficient scientific evidence to make such a statement. Is there someone who knows the fast reactor science as well as Dr. Chang or Dr. Till who holds that view? Certainly not the MIT study (as they admitted up front). So whose expert opinion are you relying on here?¶ Secondly, if your statement was true, then aren't these statements directly in direct conflict with the facts? If the critics are to be relied upon, then none of the following would have been possible at all:¶ – The Monju reactor was undamaged by the fire (rated 1 on a scale of 0 to 7, with 7 being the most serious accident), and has been kept shut down for political reasons. I think it has been given the go-ahead to start up.¶ – The EBR-II fast reactor worked flawlessly for many years (http://www.world-nuclear.org/info/inf98.html 31 years from 1963-1994)¶ – The Phenix fast reactor in France has been on-line for decades.¶ – The Superphenix reactor was shut down for political reasons, after it finally had its problems behind it and was working well.¶ – The Russian BN-600 has been working well for decades.¶ Ray Hunter was for the past 29 years as the former Deputy Director of the Office of Nuclear Energy, Science and Technology in the U.S. Department of Energy (DOE). Should his view count? Here's what he wrote to me:¶ My name is Ray Hunter. I am the former Deputy Director of the Office of Nuclear Energy, Science and Technology in the U.S. Department of Energy (DOE). I spent more than 29 years in DOE and the predecessor agencies working on developing advanced nuclear reactors for civilian nuclear power applications. After evaluating several alternatives, I came to the conclusion that a sodium cooled fast reactor using metal fuel and non aqueous reprocessing offered the best option to compliment and eventually replace Light Water Reactors (LWR’s). The basis for my conclusion was the successful proof of principle demonstration work completed by Argonne National Laboratory. It is important to understand that there were had two versions of the IFR concept; the second version involved a sodium cooled reactor using mixed uranium oxide and plutonium oxide fuel and aqueous reprocessing. The second version required separating Plutonium-239 for fabrication into new fuel which was considered to be a major proliferation issue. Unfortunately, the Clinton administration considered all fast reactors concepts as too much of a proliferation risk and cancelled all work on fast reactors. Actually, the decision to forgo processing of LWR fuel as enacted into law by 1982 Radioactive Waste Management Policy Act was the precursor for ending fast reactor technology development. The Department did continue to support in corporation with industry advanced LWR designs for future use. These advanced designs have been approved by the Nuclear Regulatory Commissions but none have been ordered in the U.S. because of the unresolved waste issue and the economic risk of trying to build and license a nuclear power plant in the U.S. Versions of these advanced LWR designs have already been built and are operating in Japan and South Korea.¶ The ill conceived U.S. policy of a once through LWR fuel cycle has never been adopted by any other nuclear power nation. According to Senator Reid, Yucca Mountain will not proceed as long as his any say in the matter. Until there is a path forward on LWR spent fuel, it is unlikely any new nuclear plant will be built in the U.S. The technical facts clearly show that the most cost effective and environmentally sound way to deal with LWR spent fuel is use the IFR concept with metal fuel and non aqueous reprocessing. While the proposed GNEP concept does not require plutonium separation, it is still based on oxide fuel and aqueous reprocessing which does allay proliferation concerns. Also, the GNEP concept is being offered as global solution for minimizing nuclear proliferation based on certain countries doing reprocessing including the U.S. but our current law precludes it. ¶ I am attaching a recent letter I sent to Senator Reid. In my judgment, we need to focus on the waste issue to break the logjam on nuclear power in the U.S. We don’t need to deploy the IFR in the private sector for the foreseeable future to get the benefits of expanded nuclear power use. If inviting the IAEA to oversee IFR facilities at government sites would promote acceptance of reprocessing, then we should proceed accordingly. Any thoughts you have on this matter would be appreciated.¶ Q. A lot of critics claim the plants will be too expensive to build.¶ The cost of a power plant is often expressed in terms of dollars per kilowatt of capacity. Every $1,000/kWe in initial cost adds, very roughly, one cent per kilowatt-hour to the cost of the electricity (assuming a 40-year write-off period and an interest rate of 8.5% per year).¶ The cost of a nuclear plant is very hard to predict these days, because it depends heavily on the regulatory climate. In more detail, here's something Eric Loewen (GE) has written on the subject of cost:¶ . . . This is not to say that PRISM or any other nuclear reactor will be inexpensive when built in the United States. The same GE Hitachi reactors that were built in Japan in the late 90s for about $1,400/kW are estimated to cost several times that much in the USA. Considering that the actual cost of raw materials is an insignificant portion of that price (about $35/kW), and that interest rates are at record low levels, the significantly higher price tags being bandied about by private utility companies reflects a regulatory/corporate/governmental environment that needs fixing. Part of the problem could be solved by a commitment to nuclear power from the federal government, streamlined licensing procedures for standardized designs, and shielding from interminable lawsuits like those that crippled the nuclear power industry in the 70s and 80s. ¶ There is nothing inherently uneconomical about nuclear power. Japan imports virtually all their building materials and has high labor costs. If they can build GE ABWR plants for a very reasonable price, there is no reason why the USA shouldn't be able to do the same.¶ Q. How many IFR plants do we need to replace all the coal plants in the US?¶ There are 200 nuclear plants now supplying 20% of our power. Coal provides about half our power. So you'd need about 400 new nuclear plants to displace all the coal plants.

#### The plan solves cost-competitiveness and international adaptation –

#### a. Gradual upsizing

**Till 11** [“PLENTIFUL ENERGY ¶ The Story of the Integral Fast Reactor¶ The complex history of a ¶ simple reactor technology, ¶ with emphasis on its ¶ scientific basis for non-specialists¶ CHARLES E. TILL, Nuclear physicist and associate lab director at Argonne National Laboratory West, and YOON IL CHANG”]

Some notion of likely cost competitiveness can be gained from past fast reactor ¶ construction experience, but the information available is limited. It can be said that ¶ the capital costs per MWe of the early fast reactors built around the world were ¶ much higher than those of LWRs. But the comparisons are not by any means direct ¶ and unambiguous. In comparison to the LWR, every difference between the two ¶ adds a cost increment to the fast reactor. With one significant exception, they were ¶ much smaller in size and electrical capacity than the LWRs built for commercial ¶ electricity generation. There were only a few of them. They were built as ¶ demonstration plants, by governments underwriting fast reactor development. There ¶ was basically one demonstration per country, with no follow-on to take advantage ¶ of the experience and lessons learned. Nor were they scaled up and replicated. The ¶ LWR had long since passed the stage where first-of-a-kind costs were involved, and ¶ had the advantage of economies of scale as well. Further, their purpose was ¶ commercial, with the attendant incentive to keep costs down. None of this has ¶ applied to fast reactors built to the present time.¶ Experience with thermal reactor types, as well as other large-scale construction, ¶ has shown that capital cost reduction follows naturally through a series of demonstration plants of increasing size once feasibility is proven. This has been ¶ true in every country, with exceptions only in the periods when construction ¶ undergoes lengthy delays due to organized anti-nuclear legal challenges. But this ¶ phased approach of multiple demonstration plants is no longer likely to be ¶ affordable, and in any case, with the experience worldwide now, it is probably ¶ unnecessary for a fast reactor plant today. Estimating the ―settled down‖ capital ¶ cost potential is not an easy task without such experience. Nevertheless, as the ¶ economic competitiveness of the fast reactor is taken to be a prerequisite to ¶ commercial deployment, we do need to understand the capital cost potential of the ¶ fast reactor and what factors influence it. 275

#### b. International cooperation and modeling

**Blees et al** 11 (Tom Blees1, Yoon Chang2, Robert Serafin3, Jerry Peterson4, Joe Shuster1, Charles Archambeau5, Randolph Ware3, 6, Tom Wigley3,7, Barry W. Brook7, 1Science Council for Global Initiatives, 2Argonne National Laboratory, 3National Center for Atmospheric Research, 4University of Colorado, 5Technology Research Associates, 6Cooperative Institute for Research in the Environmental Sciences, 7(climate professor) University of Adelaide, "Advanced nuclear power systems to mitigate climate change (Part III)," 2/24/11) [http://bravenewclimate.com/2011/02/24/advanced-nuclear-power-systems-to-mitigate-climate-change/-http://bravenewclimate.com/2011/02/24/advanced-nuclear-power-systems-to-mitigate-climate-change/](http://bravenewclimate.com/2011/02/24/advanced-nuclear-power-systems-to-mitigate-climate-change/-http%3A//bravenewclimate.com/2011/02/24/advanced-nuclear-power-systems-to-mitigate-climate-change/)

There are many compelling reasons to pursue the rapid demonstration of a full-scale IFR, as a lead-in to a subsequent global deployment of this technology within a relatively short time frame. Certainly the urgency of climate change can be a potent tool in winning over environmentalists to this idea. Yet political expediency—due to widespread skepticism of anthropogenic causes for climate change—suggests that the arguments for rolling out IFRs can be effectively tailored to their audience. Energy security—especially with favorable economics—is a primary interest of every nation.¶ The impressive safety features of new nuclear power plant designs should encourage a rapid uptick in construction without concern for the spent fuel they will produce, for all of it will quickly be used up once IFRs begin to be deployed. It is certainly manageable until that time. Burying spent fuel in non-retrievable geologic depositories should be avoided, since it represents a valuable clean energy resource that can last for centuries even if used on a grand scale.¶ Many countries are now beginning to pursue fast reactor technology without the cooperation of the United States, laboriously (and expensively) re-learning the lessons of what does and doesn’t work. If this continues, we will see a variety of different fast reactor designs, some of which will be less safe than others. Why are we forcing other nations to reinvent the wheel? Since the USA invested years of effort and billions of dollars to develop what is arguably the world’s safest and most efficient fast reactor system in the IFR, and since several nations have asked us to share this technology with them (Russia, China, South Korea, Japan, India), there is a golden opportunity here to develop a common goal—a standardized design, and a framework for international control of fast reactor technology and the fissile material that fuels them. This opportunity should be a top priority in the coming decade, if we are serious about replacing fossil fuels worldwide with sufficient pace to effectively mitigate climate change and other environmental and geopolitical crises of the 21st century.

#### c. Modularity

**Blees 9** [“Integral Fast Reactors for the masses”, Brave New Climate, Posted on 12 February 2009 on post by Barry Brook, Professor of Climate Change @ University of Adelaide, Tom Blees, National Center for Atmospheric Research]

IFRs would be wholly modular, both the reactors and recycling facilities, built in factories and assembled on site. Thus the fabrication of the modules could be distributed among companies around the world (Siemens, GE, Westinghouse, AREVA, Toshiba, etc) and would certainly benefit from economies of scale, as well as improved quality control.¶ In my book I assumed a cost of $2,000/kilowatt for the capital cost of the plant. As a comparison, private utility companies in the USA, where we suffer from a system that is broken on a host of levels, claim it will cost from $6-9,000/kilowatt

Yet GE was able to build their ABWR nuclear plants in Japan for about $1,400/kW. Clearly the USA (and GE is a U.S. company, and remember Japan imports virtually all the materials and has high labor costs) could do better if they got sane about their regulatory, political, and corporate mess.¶ It’s been alleged that the cost of nuclear power plants are rising stratospherically because of the increasing cost of commodities, but that’s simply not true. Per Peterson, professor of nuclear engineering at the University of California in Berkeley, recently went back and calculated the materials costs for 70s-era nuclear power plants, which used far more materials/kW than the new IFRs would, but he plugged in commodities costs from 2008. The result: The cost per kilowatt comes to about $34! Virtually all of the cost of a nuclear plant comes from fabrication, labor, and profits, not from materials costs. And having a cushion from $34 to $2,000 should be seen as entirely realistic in a situation where something is built in factory-fabricated modules. In fact, should we begin deploying IFRs worldwide, the cost should be able to be considerably less than $2,000/kW.

#### IFR’s are really safe

**Blees et al 11** (Tom Blees1, Yoon Chang2, Robert Serafin3, Jerry Peterson4, Joe Shuster1, Charles Archambeau5, Randolph Ware3, 6, Tom Wigley3,7, Barry W. Brook7, 1Science Council for Global Initiatives, 2Argonne National Laboratory, 3National Center for Atmospheric Research, 4University of Colorado, 5Technology Research Associates, 6Cooperative Institute for Research in the Environmental Sciences, 7(climate professor) University of Adelaide, "Advanced nuclear power systems to mitigate climate change (Part III)," 2/24/11) http://bravenewclimate.com/2011/02/24/advanced-nuclear-power-systems-to-mitigate-climate-change/-http://bravenewclimate.com/2011/02/24/advanced-nuclear-power-systems-to-mitigate-climate-change/

Metal Fuel: The Ultimate Safety Valve¶ One of the most important of the many superlatives of the IFR is its use of a metal fuel comprised of uranium, plutonium and zirconium, and the ingenious manner in which the Argonne team solved the problems of fuel expansion and fuel fabrication, as well as the potentially dangerous overheating scenario. Unlike the fuel fabrication of oxide-fueled reactors that requires the dimensions of the fuel pellets to be uniform to very exacting tolerances, the metal fuel for the IFR can be simply injected into molds and then cooled and inserted into metal tubes (cladding) with a great deal of dimensional tolerance, with a sodium bond filling any voids. If an accident situation occurs that would cause the core to overheat, such as a loss of coolant flow accident, the metal fuel itself will expand, causing neutron leakage to terminate the chain reaction, relying on nothing but the laws of physics.¶ The passive safety characteristics of the IFR were tested in EBR-II on April 3, 1986, against two of the most severe accident events postulated for nuclear power plants. The first test (the Loss of Flow Test) simulated a complete station blackout, so that power was lost to all cooling systems. The second test (the Loss of Heat Sink Test) simulated the loss of ability to remove heat from the plant by shutting off power to the secondary cooling system. In both of these tests, the normal safety systems were not allowed to function and the operators did not interfere. The tests were run with the reactor initially at full power.¶ In both tests, the passive safety features simply shut down the reactor with no damage. The fuel and coolant remained within safe temperature limits as the reactor quickly shut itself down in both cases. Relying only on passive characteristics, EBR-II smoothly returned to a safe condition without activation of any control rods and without action by the reactor operators. The same features responsible for this remarkable performance in EBR-II will be incorporated into the design of future IFR plants, regardless of how large they may be [xi].¶ While the IFR was under development, a consortium of prominent American companies led by General Electric collaborated with the IFR team to design a commercial-scale reactor based upon the EBR-II research. This design, currently in the hands of GE, is called the PRISM (Power Reactor Innovative Small Module). A somewhat larger version (with a power rating of 380 MWe) is called the S-PRISM. As with all new nuclear reactor designs (and many other potentially hazardous industrial projects), probabilistic risk assessment studies were conducted for the S-PRISM. Among other parameters, the PRA study estimated the frequency with which one could expect a core meltdown. This occurrence was so statistically improbable as to defy imagination. Of course such a number must be divided by the number of reactors in service in order to convey the actual frequency of a hypothetical meltdown. Even so, if one posits that all the energy humanity requires were to be supplies solely by IFRs (an unlikely scenario but one that is entirely possible), the world could expect a core meltdown about once every 435,000 years [xii]. Even if the risk assessment understated the odds by a factor of a thousand, this would still be a reactor design that even the most paranoid could feel good about.

## 2ac

### 2AC Prolif

#### Obama will exercise nuclear leadership – empirically proven

**McManus 10** [“Obama Exerts Nuclear Leadership”, Mike McManus, Duke graduate, syndicated journalist for over forty years, including Time Magazine and dozens of other publications, VO, April 14, 2010]

Obama Exerts Nuclear Leadership (title)

"Two decades after the end of the Cold War, we face a cruel irony of history - the risk of a nuclear confrontation between nations has gone down, but the risk of a nuclear attack has gone up," said President Obama at a Nuclear Security Summit of 47 nations this week.¶ "Nuclear materials that could be sold or stolen and fashioned into a nuclear weapon exist in dozens of nations. Just the smallest amount of plutonium - about the size of an apple - could kill and injure hundreds of thousands of innocent people. Terrorist networks such as al Qaeda have tried to acquire the material for a nuclear weapon, and if they succeeded they would surely use it. Were they to do so, it would be a catastrophe for the world."¶ What's encouraging is that Obama was persuasive with a number of countries. ¶ For example, Canada, Mexico, and Ukraine committed to eliminating their surplus weapons-grade materials or to give them to the United States. Russia closed a plutonium reactor it had used to make weapons-grade fuel. Other countries agreed to convert research reactors to a fuel that could not be used for weapons.

#### dangerous tech causes a nuclear breakout – the impact is nuke war

Sokolski 9 [Henry Sokolski, Executive Director of the Nonproliferation Policy Education Center, 6/1/2009, Avoiding a Nuclear Crowd, <http://www.hoover.org/publications/policy-review/article/5534>]

Finally, several new nuclear weapons contenders are also likely to emerge in the next two to three decades. Among these might be Japan, North Korea, South Korea, Taiwan, Iran, Algeria, Brazil (which is developing a nuclear submarine and the uranium to fuel it), Argentina, and possibly Saudi Arabia (courtesy of weapons leased to it by Pakistan or China), Egypt, Syria, and Turkey. All of these states have either voiced a desire to acquire nuclear weapons or tried to do so previously and have one or more of the following: A nuclear power program, a large research reactor, or plans to build a large power reactor by 2030. With a large reactor program inevitably comes a large number of foreign nuclear experts (who are exceedingly difficult to track and identify) and extensive training, which is certain to include nuclear fuel making.19 Thus, it will be much more difficult to know when and if a state is acquiring nuclear weapons (covertly or overtly) and far more dangerous nuclear technology and materials will be available to terrorists than would otherwise. Bottom line: As more states bring large reactors on line more will become nuclear-weapons-ready — i.e., they could come within months of acquiring nuclear weapons if they chose to do so.20 As for nuclear safeguards keeping apace, neither the iaea’s nuclear inspection system (even under the most optimal conditions) nor technical trends in nuclear fuel making (e.g., silex laser enrichment, centrifuges, new South African aps enrichment techniques, filtering technology, and crude radiochemistry plants, which are making successful, small, affordable, covert fuel manufacturing even more likely)21 afford much cause for optimism. This brave new nuclear world will stir existing security alliance relations more than it will settle them: In the case of states such as Japan, South Korea, and Turkey, it could prompt key allies to go ballistic or nuclear on their own. Nuclear 1914 At a minimum, such developments will be a departure from whatever stability existed during the Cold War. After World War II, there was a clear subordination of nations to one or another of the two superpowers’ strong alliance systems — the U.S.-led free world and the Russian-Chinese led Communist Bloc. The net effect was relative peace with only small, nonindustrial wars. This alliance tension and system, however, no longer exist. Instead, we now have one superpower, the United States, that is capable of overthrowing small nations unilaterally with conventional arms alone, associated with a relatively weak alliance system ( nato) that includes two European nuclear powers (France and the uk). nato is increasingly integrating its nuclear targeting policies. The U.S. also has retained its security allies in Asia (Japan, Australia, and South Korea) but has seen the emergence of an increasing number of nuclear or nuclear-weapon-armed or -ready states. So far, the U.S. has tried to cope with independent nuclear powers by making them “strategic partners” (e.g., India and Russia), nato nuclear allies (France and the uk), “non-nato allies” (e.g., Israel and Pakistan), and strategic stakeholders (China); or by fudging if a nation actually has attained full nuclear status (e.g., Iran or North Korea, which, we insist, will either not get nuclear weapons or will give them up). In this world, every nuclear power center (our European nuclear nato allies), the U.S., Russia, China, Israel, India, and Pakistan could have significant diplomatic security relations or ties with one another but none of these ties is viewed by Washington (and, one hopes, by no one else) as being as important as the ties between Washington and each of these nuclear-armed entities (see Figure 3). There are limits, however, to what this approach can accomplish. Such a weak alliance system, with its expanding set of loose affiliations, risks becoming analogous to the international system that failed to contain offensive actions prior to World War I. Unlike 1914, there is no power today that can rival the projection of U.S. conventional forces anywhere on the globe. But in a world with an increasing number of nuclear-armed or nuclear-ready states, this may not matter as much as we think. In such a world, the actions of just one or two states or groups that might threaten to disrupt or overthrow a nuclear weapons state could check U.S. influence or ignite a war Washington could have difficulty containing. No amount of military science or tactics could assure that the U.S. could disarm or neutralize such threatening or unstable nuclear states.22 Nor could diplomats or our intelligence services be relied upon to keep up to date on what each of these governments would be likely to do in such a crisis (see graphic below): Combine these proliferation trends with the others noted above and one could easily create the perfect nuclear storm: Small differences between nuclear competitors that would put all actors on edge; an overhang of nuclear materials that could be called upon to break out or significantly ramp up existing nuclear deployments; and a variety of potential new nuclear actors developing weapons options in the wings. In such a setting, the military and nuclear rivalries between states could easily be much more intense than before. Certainly each nuclear state’s military would place an even higher premium than before on being able to weaponize its military and civilian surpluses quickly, to deploy forces that are survivable, and to have forces that can get to their targets and destroy them with high levels of probability. The advanced military states will also be even more inclined to develop and deploy enhanced air and missile defenses and long-range, precision guidance munitions, and to develop a variety of preventative and preemptive war options. Certainly, in such a world, relations between states could become far less stable. Relatively small developments — e.g., Russian support for sympathetic near-abroad provinces; Pakistani-inspired terrorist strikes in India, such as those experienced recently in Mumbai; new Indian flanking activities in Iran near Pakistan; Chinese weapons developments or moves regarding Taiwan; state-sponsored assassination attempts of key figures in the Middle East or South West Asia, etc. — could easily prompt nuclear weapons deployments with “strategic” consequences (arms races, strategic miscues, and even nuclear war). As Herman Kahn once noted, in such a world “every quarrel or difference of opinion may lead to violence of a kind quite different from what is possible today.”23 In short, we may soon see a future that neither the proponents of nuclear abolition, nor their critics, would ever want. None of this, however, is inevitable.

### 2AC Warming

#### Warming kills crops more – ozone, floods, weeds, natural disasters – and ceiling to CO2’s positive effect, especially for C4 plants

**NRC 11**, National Research Council, Committee on Stabilization Targets for Atmospheric Greenhouse Gas Concentrations; National Research Council [“Climate Stabilization Targets: Emissions, Concentrations, and Impacts over Decades to Millennia,” April, the National Academies Press]

Even in the most highly mechanized agricultural systems, food production is very dependent on weather. Concern about the potential impacts of climate change on food production, and associated effects on food prices and hunger, have existed since the earliest days of climate change research. Although there is still much to learn, several important findings have emerged from more than three decades of research. It is clear, for example, that higher CO2 levels are beneficial for many crop and forage yields, for two reasons. In species with a C3 photosynthetic pathway, including rice and wheat, higher CO2 directly stimulates photosynthetic rates, although this mechanism does not affect C4 crops like maize. Secondly, higher CO2 allows leaf pores, called stomata, to shrink, which results in reduced water stress for all crops. The net effect on yields for C3 crops has been measured as an average increase of 14% for 580 ppm relative to 370 ppm (Ainsworth et al., 2008). For C4 species such as maize and sorghum, very few experiments have been conducted but the observed effect is much smaller and often statistically insignificant (Leakey, 2009). Rivaling the direct CO2 effects are the impacts of climate changes caused by CO2, in particular changes in air temperature and available soil moisture. Many mechanisms of temperature response have been identified, with the relative importance of different mechanisms varying by location, season, and crop. Among the most critical responses are that crops develop more quickly under warmer temperatures, leading to shorter growing periods and lower yields, and that higher temperatures drive faster evaporation of water from soils and transpiration of water from crops. Exposure to extremely high temperatures (e.g., > 35ºC) can also cause damage in photosynthetic, reproductive, and other cells, and recent evidence suggests that even short exposures to high temperatures can be crucial for final yield (Schlenker and Roberts, 2009; Wassmann et al., 2009).

A wide variety of approaches have been used in an attempt to quantify yield losses for different climate scenarios. Some models represent individual processes in detail, while others rely on statistical models that, in theory, should capture all relevant processes that have influenced historical variations in crop production. Figure 5.1 shows model estimates of the combined effect of warming and CO2 on yields for different levels of global temperature rise. It is noteworthy that although yields respond nonlinearly to temperature on a daily time scale, with extremely hot days or cold nights weighing heavily in final yields, the simulated response to seasonal warming is fairly linear at broad scales (Lobell and Field, 2007; Schlenker and Roberts, 2009). Several major crops and regions reveal consistently negative temperature sensitivities, with between 5-10% yield loss per degree warming estimated both by process-based and statistical approaches. Most of the nonlinearity in Figure 5.1 reflects the fact that CO2 benefits for yield saturate at higher CO2 levels. For C3 crops, the negative effects of warming are often balanced by positive CO2 effects up to 2-3ºC local warming in temperate regions, after which negative warming effects dominate. Because temperate land areas will warm faster than the global average (see Section 4.2), this corresponds to roughly 1.25-2ºC in global average temperature. For C4 crops, even modest amounts of warming are detrimental in major growing regions given the small response to CO2 (see Box 5.1 for discussion of maize in the United States). The expected impacts illustrated in Figure 5.1 are useful as a measure of the likely direction and magnitude of average yield changes, but fall short of a complete risk analysis, which would, for instance, estimate the chance of exceeding critical thresholds. The existing literature identifies several prominent sources of uncertainty, including those related to the magnitude of local warming per degree global temperature increase, the sensitivity of crop yields to temperature, the CO2 levels corresponding to each temperature level (see Section 3.2), and the magnitude of CO2 fertilization.

#### Co2 depletes soil – kills plants and ecosystems

**Korner et al. 7 –** Christian Korner professor of botany at University Basel, Jack Morgan, plant physiologist at USDA and faculty member in the Crops and Soils Department at Colorado State University, and Richard Norby, researcher in the Environmental Sciences Division at the Oak Ridge National Laboratory (“Terrestrial Ecosystems In A Changing World”, Chapter Two: CO2 Fertilization: When, Where, How Much? p. 9-10, Google Books)

It is obvious that these carbon investments also depend on resources other than CO2, in particular mineral nutrients. A common effect of short-term plant exposure to elevated CO2 is a reduced consumption of nutrients, but also water, per unit of biomass produced (Drake et al. 1997) or a constant consumption at greater biomass per unit land area (Niklaus and Körner 2004). In cases where total nutrient uptake is increased under elevated CO2 (Finzi et al. 2002) this will deplete soil resources in the long run. In cases where tissue nutrient concentrations are depleted, this will induce **cascades of negative ecosystem level feedbacks**, which eventually may also cause initial rates of carbon gain to diminish. In many cases, it became questionable whether carbon is a limiting resource at the whole plant or ecosystem level (Körner 2003a). It is worth recalling that all taxa of today’s biosphere grew and reproduced successfully with only 180–190 ppm, half the current CO2 concentration, 18 000 years before present (peak of last glaciation). Based on this reference period, current biota operate already in a double CO2 atmosphere. In addition, the observed reduction of water consumption per unit land area is likely to induce climatic feedbacks (through a drier atmosphere), not yet accounted for in experiments. Furthermore, any CO2 enrichment effect on plants will depend on their developmental stage, with younger plants more responsive than older ones (Loehle 1995). Most of the CO2-enrichment responses for woody species available to date are – for very practical reasons – for young, rapidly expanding life stages, during which carbon is more likely a limiting resource.

#### Reject ev – bias

**Anthony 09 –** a Senior Research Fellow at the Centre for Marine Studies. Ken started his work on coral reef biology at James Cook University in 1995 (Ken, “CO2 non-science journalism is not doing the World a favour” <http://www.climateshifts.org/?p=1043>)

Remember the last time you tried to reason with someone who constantly took your words out of context in an attempt to argue an opposite futile point? If that left you smiling politely while shaking your head, you probably felt like me after reading the article “Coral Reefs and Climate Change: Unproved Assumptions” by the Idso family posted on their website “CO2 Science” at the Center for the Study of Carbon Dioxide and Global Change**. The article is another sad addition to their more than 500 un-reviewed pieces** - all with the obvious agenda of making their readers believe that climate change science is nothing but alarmist propaganda. In their latest anti-science scribble (Vol 12, No 3) the Idso’s attempt to build the case that “it is premature to suggest that widespread reef collapse is a certain consequence of ongoing bleaching” and that “nature is far more resilient [to climate change] than many people give it credit for..” All of their quotes are from a recent paper by a group of young and excellent Australian marine biologists, Maynard, Baird and Pratchett published in Coral Reefs (27:745-749). Contrary to the Idso’s claims, Maynard et al.’s paper does not question that climate change is a threat to coral reefs. The purpose of Maynard et al.’s paper is to provoke debate around some specific assumptions of thermal thresholds and coral reef’s adaptability to climate change and the functional link between reef degradation and fisheries. Rest assured, Maynard et al. will get the debate they have provoked within the scientific community. Critiques and responses are part of the quality control system of the scientific process and add to the foundation on which our knowledge system is built across disciplines from physics and engineering to medicine. However, by running with a few bits of quotes, stitched together in a fabricated “they say” story, the Idso’s are not doing their readers any favours. Instead, the Idso’s demonstrate two points quite clearly: (1) they have very limited understanding of the science, and (2) their agenda is to write journalism that systematically attempts to discredit the best available climate-change science. After reading a number of their smear campaigns, the Center for the Study of Carbon Dioxide and Global Change takes shape of a law firm defending a client’s case (wonder who they could be?) that is up against an overwhelming amount of opposing evidence. Like rookies, they fumble in their exhibits folder, hoping to win the jury over by causing confusion. The danger of their practise is that they generate disinformation about climate change in a time when the public, the media and governments are in urgent need of good information.

#### No Asia war—multiple safeguards and reversible tensions

**Feng 10 –** professor at the Peking University International Studies [Zhu, “An Emerging Trend in East Asia: Military Budget Increases and Their Impact”, http://www.fpif.org/articles/an\_emerging\_trend\_in\_east\_asia?utm\_source=feed]

As such, the surge of defense expenditures in East Asia does not add up to an arms race. No country in East Asia wants to see a new geopolitical divide and spiraling tensions in the region. The growing defense expenditures powerfully illuminate the deepening of a regional “security dilemma,” whereby the “defensive” actions taken by one country are perceived as “offensive” by another country, which in turn takes its own “defensive” actions that the first country deems “offensive.” As long as the region doesn’t split into rival blocs, however, an arms race will not ensue. What is happening in East Asia is the extension of what Robert Hartfiel and Brian Job call “competitive arms processes.” The history of the cold war is telling in this regard. Arm races occur between great-power rivals only if the rivalry is doomed to intensify. The perceived tensions in the region do not automatically translate into consistent and lasting increases in military spending. Even declared budget increases are reversible. Taiwan’s defense budget for fiscal year 2010, for instance, will fall 9 percent. This is a convincing case of how domestic constraints can reverse a government decision to increase the defense budget. Australia’s twenty-year plan to increase the defense budget could change with a domestic economic contraction or if a new party comes to power. China’s two-digit increase in its military budget might vanish one day if the type of regime changes or the high rate of economic growth slows. Without a geopolitical split or a significant great-power rivalry, military budget increases will not likely evolve into “arms races.” The security dilemma alone is not a leading variable in determining the curve of military expenditures. Nor will trends in weapon development and procurement inevitably induce “risk-taking” behavior. Given the stability of the regional security architecture—the combination of U.S.-centered alliance politics and regional, cooperation-based security networking—any power shift in East Asia will hardly upset the overall status quo. China’s military modernization, its determination to “prepare for the worst and hope for the best,” hasn’t yet led to a regional response in military budget increases. In contrast, countries in the region continue to emphasize political and economic engagement with China, though “balancing China” strategies can be found in almost every corner of the region as part of an overall balance-of-power logic. In the last few years, China has taken big strides toward building up asymmetric war capabilities against Taiwan. Beijing also holds to the formula of a peaceful solution of the Taiwan issue except in the case of the island’s de jure declaration of independence. Despite its nascent capability of power projection, China shows no sign that it would coerce Taiwan or become **militarily assertive** over contentious territorial claims ranging from the Senkaku Islands to the Spratly Islands to the India-China border dispute.

### 2AC Europe

#### Financial arrangements create resilient currency – only supply shocks trigger

**Wyplosz 12** [“Euro-Doom Is Fantasy, Why the Currency Won’t Collapse”, Charles Wyplosz, professor of economics at the Graduate Institute of International and Development Studies in Geneva, Bloomberg, Apr 1, 2012]

When the euro was being created, the economics profession split into three groups -- enthusiasts, opponents and realists -- that predicted wildly different costs and benefits for the project. By 2007, when the young currency was thriving, the enthusiasts declared a premature victory. Now it’s the turn of the opponents, and they are, of course, wrong.¶ I say “of course” because currencies are meant to exist for centuries. Their performance cannot be judged after five or 15 years. It’s understandable that people who felt a strong prejudice for or against the euro’s existence should feel the itch to make a point when things turn their way, but the point is bound to be misleading, and intentionally so. The reality, however, is that changes in the broad flow of history, which the euro certainly was, require a much longer view. If you want to prove your case early, you need to abuse the data.¶ Consider the growth performance of four relatively small and comparable European countries, two of which are in the euro area (Finland and the Netherlands), and two of which (Sweden and Switzerland) kept their own currencies. With the right tricks, you can use the experience of these four countries to prove what you will about the euro’s viability. One trick is to choose the right period from which to draw your data. Another is to normalize the data on a particular year to create the impression that you want to project.¶ Picking Periods¶ Chart A covers the period 2001-2011, which is convenient if you wish to show the euro’s failure, because in that period Sweden and Switzerland largely outperformed the Netherlands. But doing so ignores the very relevant fact that Sweden and Switzerland underwent their own housing-price bubbles, complete with banking crises, in the early 1990s. Chart B shows that since those crises, these two non-euro economies have struggled to make up the ground they lost. Switzerland, in particular, failed massively in this respect.¶ Add in Finland, a euro-area member that underwent a similar crisis in the 1990s, and the problem becomes clear. A comparison of Finland with fellow Nordic country Sweden suggests that adopting the euro made no difference at all to economic performance. The correct conclusion is that selecting countries and years is simply not an acceptable way of building an argument. There may be a case against the single currency’s viability, but it has to be based on firmer ground.¶ There is such a case, plain for all to see, and it’s fiscal indiscipline. A monetary union cannot last if fiscal discipline is not respected in every member country. Once individual countries give up their monetary policies, their public debts are effectively issued in a foreign currency, as Paul de Grauwe has shown. A government that has allowed its debt to become so large that it loses market access must be either helped or allowed to default.¶ Help can be in the form of inflation, loans or even grants, from other governments or the common central bank. The problem with help is that it generates perverse incentives, otherwise known as moral hazard. So once fiscal indiscipline has occurred, there are only bad options. And, indeed, here we are. But what does this failure mean?¶ The view of many euro opponents is that because the euro area has failed to establish fiscal discipline, the project is now doomed. There is no doubt that fiscal discipline has been lost, but that does not mean the problem can’t be fixed. In fact, the governments involved believe that it can be fixed, right now.¶ Show of Faith¶ Bearing responsibility for the explosion of public debts (more than 80 percent of gross domestic product in France and Germany, for instance), policy makers now exhibit a zealot-like faith that the necessary discipline can be established over the next two or three years. As they impose austerity on countries that lost market access and are in a recession, they make matters worse, of course, but more ominously they also show they still fail to grasp that fiscal discipline is a long-run concept.¶ The reality is that a few years of surpluses or deficits hardly tell us anything about fiscal discipline. Thus the zealots, who are broadly part of the euro-enthusiast group, provide the euro’s opponents with a solid argument: namely, that the euro area is unable to deal with its own flaws. This case, however, is not made loudly by the euro’s opponents because they fear they might be listened to, and that the euro area would end up fixing its most glaring flaw. (They should relax, the euro has many other failings, some potentially lethal, but now is not the time to list them).¶ That the euro area suffers from flaws is nothing particularly damning. It is a complex undertaking and the real surprise would be to have it 100 percent right the first time. This is where history comes into play. The euro will survive if the flaws are eventually fixed, but we’ll probably have to wait a few years or decades to know.

### 2AC Counterplan

#### Can’t solve – just shifts regional climate problems around and exacerbates ocean acidification

**Kenward 11** [Alyson, “Brighten the Water: Proceed with Caution”, Feb 15, ClimateCentral]

Seitz’s findings, published in Climatic Change in December 2010, says that this approach to SRM has the advantage of being more localized than spraying aerosols into the atmosphere, so it is less risky to humans. He proposes that teeny tiny bubbles can be easily injected into the water, at low cost and without requiring much energy. Sounds great, you might think.¶ Not so fast, says Alan Robock.¶ As an atmospheric scientist at Rutgers University, Robock has been studying the potential effects of different types of SRM on the planet. A few days ago, he posted an official response to Seitz’s “brighten the water” pitch, also in Climatic Change. In it, Robock points out that although increasing reflectivity of ocean water takes away some of the risks that come along with pumping sulfate aerosols into the air, it also introduces a host of new ones — risks that can’t be fully evaluated or easily managed.¶ For example, Robock points out that if parts of the ocean are engineered to be more reflective and consequently absorb less heat, the movement of heat in the ocean may change, and there is the potential that regional climate and weather would be affected.¶ Just think about how much global climate has been influenced this year by the cool ocean waters of La Niña in the Pacific: increased rainfall in Asia, Australia and parts of South America; heavier snowfall in parts of the U.S.; and more severe drought in the American Southwest.¶ Affecting the way oceans absorb and retain heat may impact crucial ocean currents, causing unusual weather in some places. Credit: NOAA¶ Furthermore, cooler ocean temperatures and less sunlight is bound to have some influence on marine life, although it is difficult to predict exactly what would happen. Colder water also holds more CO2, so Robock mentions that there might be more risk of ocean acidification using Seitz’s technique.¶ Robock writes:¶ “Bubble generation in the ocean should be added to the list of solar radiation management options being considered as part of geoengineering, but it needs to be rigorously evaluated, [along with marine cloud brightening and stratospheric aerosol generation], in terms of its costs, benefits, and risks.”

#### Hydrological cycle collapse causes extinction

**Bryant, 3 –** Donald A. Bryant, Dep’t. of Biochemistry and Molecular Biology @ Penn. State University, “The Beauty in Small Things Revealed”, Proceedings of the National Academy of Sciences, August 19, 2003, http://www.pnas.org/cgi/content/full/100/17/9647

Oxygenic photosynthesis accounts for nearly all the primary biochemical production of organic matter on Earth. The byproduct of this process, oxygen, facilitated the evolution of complex eukaryotes and supports their/our continuing existence. Because macroscopic plants are responsible for most terrestrial photosynthesis, it is relatively easy to appreciate the importance of photosynthesis on land when one views the lush green diversity of grasslands or forests. However, Earth is the "blue planet," and oceans cover nearly 75% of its surface. All life on Earth equally depends on the photosynthesis that occurs in Earth's oceans. '

#### CP is all theory – can’t solve warming

**Caldiera and Keith 10** [Ken Caldiera, David W. Keith, “The Need for Climate Engineering Research”, Ken Caldeira (kcaldeira@carnegie.stanford.edu) is a senior scientist in the Department of Global Ecology at the Carnegie Institution in Stanford, California. David W. Keith (keith@ucalgary.ca) is director of the Energy and Environmental Systems Group at the Institute for Sustainable Energy, Issues in Science and Technology, 2010]

**SRM = Solar Radiation Management**

Whitening the surface. It has been proposed that whitening roofs, crops, or the ocean surface would reflect more¶ sunlight to space, thereby exerting a cooling influence on¶ planetary temperatures. With regard to crops, there is simply not enough crop area or potential for change in reflectivity for this sector to be a game changer. Similarly, there is¶ not enough roof area for changing roof color to make a substantive difference in global climate change, although whitening roofs in some cases may confer co-benefits (such as reducing cooling costs and helping reduce the urban heat island effect). Various proposals have been made to whiten¶ the ocean surface, stemming back to at least the early 1960s,¶ but the ability to do so has not been demonstrated.¶ In their current form, the best SRM methods have several¶ common properties: They have relatively low direct costs¶ of deployment, they may be deployed rapidly and are fastacting, and they are imperfect. They are intrinsically imperfect because greenhouse gases and sunlight act differently in Earth’s climate system.

#### Peak uranium by the end of the decade – plan solves

**Crawford 11** [“Peak Uranium By 2015?”, 6/22/11, Black Swan Insights, Nathaniel Crawford—B.A. from Occidental College, 9 years of experience in financial markets, as stock trader, bonds trader, investor, and analyst]

A new research report says yes. The report goes on to say that short of a complete nuclear phase-out, the world will run out of uranium by the end of the decade. Here are the major conclusions:¶ • A production decline from essentially all mines operating on particular deposits is unavoidable during the present decade.¶ • This decline can only be partially compensated by the planned new mines.¶ • Assuming that all new uranium mines can be opened as planned, annual mining will be increased from the 2010 level of 54 ktons to about 58 ± 4 ktons in 2015.¶ • After 2015 uranium mining will decline by about 0.5 ktons/year up to 2025 and much faster thereafter. The resulting maximal annual production is predicted as 56 ± 5 ktons (2020), 54 ± 5 ktons (2025) and 41 ± 5 ktons (2030).¶ Assuming that the demand side will be increased by 1% annually, we predict both shortages of uranium and (inflation-adjusted) price hikes within the next five years.¶ ........¶ Therefore, assuming that a global slow phase-out scenario will not be chosen on a voluntary basis, we predict that the end of the cheap uranium supply will result in a chaotic phase-out scenario with price explosions, supply shortages and blackouts in many countries.¶ To read the full report: click here¶ The report contends that the only way for supply to keep up with demand would be if the US and Russia recycle their nuclear weapons into low enriched uranium fuel. The Russians have been doing this since 1993 under the Megatons to Megawatts program, but the program is expected to end in 2013. The Russians have indicated that they do not expect to renew the program.

**Peak uranium causes nuclear war**

**Konstantiov 12 –** professor of math at Moscow State and member of numerous scientific/geological councils

(Mihail Konstantiov, Professor of Mathematics with the University of Architecture, Civil Engineering and Geodesy (UACEG), Bulgaria, Vice-Chancellor of UACEG (1999-2003), Member of scientific councils and commissions, Member of the Board of IICREST. He has authored 30 books and over 500 scientific papers. He has participated in international scientific projects of EU and NATO and realized research and lecturing visits in British, German and French universities. Prof. Konstantinov has been Member and Vice Chair of the Central Election Commission of Bulgaria and Voting coordinator of OSCE (1997-) as well as the Bulgarian representative at the Council of Europe on electronic voting. In addition to his scientific publications, he has authored more than 300 articles in Bulgarian editions devoted to social and political issues with emphasis on election practice and legislation., “Uranium time bomb ticking”, Europost, 2-11-2012, http://www.europost.bg/article?id=3763)

In 1945, the US had three nucle­ar bombs - two plu­to­ni­um-based devi­ces and a ura­ni­um-based one. The first one was det­o­nat­ed on a test site in New Mex­i­co, and the sec­ond and third ones over Jap­a­nese ter­ri­to­ry. On 6 August 1945, the then-only ura­ni­um-based bomb was thrown over the Jap­a­nese city of Hiro­shi­ma. What hap­pened is well known and I will not re-tell it. More­over, this sto­ry deals with nucle­ar weap­ons but they are not the main char­ac­ters. Almost 20 years ago, an agree­ment was inked under which the US under­took to help dis­man­tle Rus­sian nucle­ar war­heads and con­vert the ura­ni­um from them into fuel for nucle­ar reac­tors. The rea­son is sim­ple - the pro­ce­dure is expen­sive, Rus­sia was weak and poor at the time, and in addi­tion, Amer­i­can tech­nol­o­gy back then was sig­nif­i­cant­ly ahead of the Rus­sian one. The amounts of con­vert­ed ura­ni­um are mas­sive - more than 500 ton­nes. Thus Rus­sian ura­ni­um turns into fuel for US nucle­ar pow­er plants. At present, this fuel is used to pro­duce 10% of the elec­tri­cal pow­er in the US. This is more than the ener­gy pro­duced from renew­a­ble sour­ces, such as sun, wind and water, there. This idyll, how­e­ver, is com­ing to its end. First, the US-Rus­sia agree­ment for Rus­sian war­heads con­ver­sion expires next year and Rus­sia is high­ly unlike­ly to extend it. More­over, Rus­sians now have good tech­nol­o­gy for that pur­pose and will prob­a­bly want to leave their ura­ni­um for them­selves. And sec­ond, if the agree­ment is extend­ed, the amounts of war­heads sub­ject to dis­man­tling will soon be exhaust­ed any­way as the agreed lim­its are reached. Glob­al mar­kets have already start­ed sus­pect­ing what is going to hap­pen with the expir­ing US-Rus­sia agree­ment for war­head ura­ni­um. And not only with it. Indeed, ura­ni­um oxide pri­ces have gone wild sur­ging to almost $70/lb (1lb is 454 gr.) in Jan­u­ary this year from $40/lb in Sep­tem­ber 2011. Such a 70% ral­ly in ura­ni­um price over just 3-4- months is not sus­tain­a­ble and even a cer­tain edg­ing down can be expect­ed. Still, the **trend** is clear - ura­ni­um dearth is loom­ing, as well as dearth of oth­er stra­te­gic nat­u­ral resour­ces. We have repeat­ed­ly stat­ed this but let us under­score it again. The glob­al cri­sis is **most of all** a resource cri­sis. It is finan­cial inso­far as it has became clear that the sys­tem allow­ing some peo­ple to print mon­ey while oth­ers work and bring them oil and oth­er goods will not last for good. The antic­i­pat­ed ura­ni­um short­age in the com­ing dec­ade is tru­ly strik­ing and is esti­mat­ed at 500m lb! One of the rea­sons is the fast devel­op­ing econ­o­mies of Chi­na and India, along with oth­er coun­tries like Bra­zil and Tur­key. It is where the bulk of the 147 reac­tors expect­ed to become oper­a­tion­al in these 10 years will be locat­ed. **A major consum­er** of ura­ni­um, the US cur­rent­ly has a demand for 60m lb a year but pro­du­ces only 3m lb. Still, this is the way things are at present. And what will hap­pen aft­er the US Nucle­ar Reg­u­la­to­ry Com­mis­sion reviews and poten­tial­ly approves new nucle­ar reac­tor pro­pos­als? They are 26 or so. And more are in the pipe­line. The sit­u­a­tion in India is even more dra­mat­ic - an increase in the share of nucle­ar ener­gy in elec­tric­i­ty pro­duc­tion is expect­ed from 2.5% at present to 25%. In oth­er words, India will need 10 times as much ura­ni­um as it does now if the far-reach­ing plan is put to prac­tice. Chi­na has more hum­ble aspi­ra­tions and is gear­ing to raise the share of nucle­ar facil­i­ties in elec­tric­i­ty pro­duc­tion only ...three times. And Chi­na, much like the US, does not have suf­fi­cient domes­tic sup­ply. We can con­tin­ue with sta­tis­tics, but things are evi­dent any­way. A war is around the cor­ner. In the best-case sce­nar­io, this will be a price war over ura­ni­um and in par­tic­u­lar ura­ni­um oxide. Pri­ces in the order of $100 or even $200/lb no longer seem far-fetched. Price lev­els of $500-$1000-$2000/lb have even been men­tioned and this will have its swift and dras­tic impli­ca­tions. Still, if a reac­tor costs $4bn, why not pay $1000/lb of ura­ni­um? Or else, the 4-bil­lion invest­ment will go down the drain. Anoth­er explod­ing glob­al mar­ket is the one for rare earth ele­ments with hard-to-pro­nounce Lat­in names such as Neo­dym­i­um, Ceri­um, Lan­tha­num, Gal­li­um, Gado­lin­i­um, Thu­li­um… If we have a look at Men­de­leev's peri­od­ic table, they are squeezed some­where at the bot­tom. But then, all the elec­tron­ics around us, all com­put­ers, fibre optics, all sat­el­lites and in gen­er­al every­thing under­ly­ing our high-tech civ­il­i­za­tion would be utter­ly impos­si­ble but for these exot­ic hard-to-extract ele­ments. The price of each of them has dou­bled and tri­pled in a year alone. And the pri­ces of some of them have soared six­fold in the same peri­od. Com­pared with rare earth ele­ments, gold and plat­i­num are like a tame kit­ten. It nat­u­ral­ly eats and swells but at a rate of only up to 40% a year. And what about the lith­i­um under­ly­ing the idea of elec­tric vehi­cles stag­ing a mass entrance into our dai­ly life and econ­o­my if and when oil is exhaust­ed? But it is in rare ele­ments where the secret of future skir­mish­es over resour­ces lies. Because across the world, they are real­ly hard to extract but Chi­na holds 97% of their glob­al pro­duc­tion! No mis­take, Chi­na pro­du­ces 33 times as much rare met­als as the rest of the world. This may as well be changed some day as cur­rent­ly huge efforts and mon­ey are put into look­ing for rare met­als around the globe. Hypo­thet­i­cal­ly, only a third of the res­erves is in Chi­na with the oth­er two thirds lying some­where else. Too bad it is any­one's guess where, although Cana­da, South Afri­ca and some Afri­can coun­tries are con­sid­ered prom­is­ing in this regard. Still, for the time being this is how things are: Chi­na has almost every­thing and the rest of the world hard­ly any­thing. Does any­one have any doubts why Chi­na has the ambi­tion to become the top dog? Of course, the world is by no means tread­ing water in one oth­er respect: sub­sti­tute tech­nol­o­gies are sought for that would not be so crit­i­cal­ly depend­ent on rare earth ele­ments, yet, more in the long rath­er than short run. By the way, why are we dis­cuss­ing ura­ni­um pri­ces along with all oth­er sorts of pri­ces in US dol­lars? The answer is clear: because the dol­lar is the glob­al reserve cur­ren­cy. The rea­son for this, though, is more com­pli­cat­ed. True, the US is the larg­est econ­o­my for the time being. But it is also among the most indebt­ed coun­tries in the world. And its debt is increas­ing­ly sur­ging. Still, this is not the most impor­tant. The most impor­tant thing is that the US has the most pow­er­ful, most mobile and one of the most effect­ive armies in the world. Lit­tle like­ly is it for some­one to reject the US dol­lar as a reserve cur­ren­cy while the 82nd Air­borne Divi­sion of the US Army, based at Fort Bragg North Car­o­li­na, is the holy ter­ror it is at the moment. And there is much more to it than the 82nd Divi­sion. So the time bomb of ura­ni­um and rare earth ele­ments dearth is tick­ing. And lit­tle idea do we have of the time it is set for. Or wheth­er, when it final­ly goes off, some­body might remem­ber the first mas­sive appli­ca­tion of ura­ni­um, which turned thou­sands into ash­es some 67 years ago. **And be temp­ted to use it**

### 2AC Russia DA

#### Lower natural gas prices now – and they’re key to the economy

**Reuters 12** [“U.S. Export Surge Could Add 5 Million Jobs By 2020: Report”, 9/21/12]

Rising U.S. factory productivity, spurred by falling natural gas prices, could help the nation boost exports of products such as locomotives and factory machinery and add as many as 5 million manufacturing and support jobs by the decade's end, a new analysis found.¶ High worker productivity and low energy prices driven by a surge in shale gas production will give the United States a cost advantage in exports against Western European rivals and Japan in the coming years, according to a Boston Consulting Group report set for release on Friday.¶ By 2015, those factors will make average manufacturing costs in the United States lower by 15 percent than in Germany and France, 8 percent than in the United Kingdom and 21 percent than in Japan, the study projects. Factories' costs in China will remain 7 percent cheaper than those in the United States, however.

#### Collapse of natural gas industry inevitable- Overleveraged, prices too low

**Fahey 2012** (Jonathan Fahey, April 9, 2012, “Natural gas glut means drilling boom must slow,” Boston Globe, lexis)

The U.S. natural gas market is bursting at the seams. So much natural gas is being produced that soon there may be nowhere left to put the country's swelling surplus. After years of explosive growth, natural gas producers are retrenching. The underground salt caverns, depleted oil fields and aquifers that store natural gas are rapidly filling up after a balmy winter depressed demand for home heating. The glut has benefited businesses and homeowners that use natural gas. But with natural gas prices at a 10-year low — and falling — companies that produce the fuel are becoming victims of their drilling successes. Their stock prices are falling in anticipation of declining profits and scaled-back growth plans. Some of the nation's biggest natural gas producers, including Chesapeake Energy, ConocoPhillips and Encana Corp., have announced plans to slow down. "They've gotten way ahead of themselves, and winter got way ahead of them too," says Jen Snyder, head of North American gas for the research firm Wood Mackenzie. "There hasn't been enough demand to use up all the supply being pushed into the market." So far, efforts to limit production have barely made a dent. Unless the pace of production declines sharply or demand picks up significantly this summer, analysts say the nation's storage facilities could reach their limits by fall. That would cause the price of natural gas, which has been halved over the past year, to nosedive. Citigroup commodities analyst Anthony Yuen says the price of natural gas — now $2.08 per 1,000 cubic feet — could briefly fall below $1. "There would be no floor," he says. Since October, the number of drilling rigs exploring for natural gas has fallen by 30 percent to 658, according to the energy services company Baker Hughes. Some of the sharpest drop-offs have been in the Haynesville Shale in Northwestern Louisiana and East Texas and the Fayetteville Shale in Central Arkansas. But natural gas production is still growing, the result of a five-year drilling boom that has peppered the country with wells. The workers and rigs aren't just being sent home. They are instead being put to work drilling for oil, whose price has averaged more than $100 a barrel for months. The oil rig count in the U.S is at a 25-year high. This activity is adding to the natural gas glut because natural gas is almost always a byproduct of oil drilling. Analysts say that before long companies could have to start slowing the gas flow from existing wells or even take the rare and expensive step of capping off some wells completely. "Something is going to have to give," says Maria Sanchez, manager of energy analysis at Bentek Energy, a research firm. U.S. natural gas production has boomed in recent years as a result of new drilling techniques that allow companies to unlock fuel trapped in shale formations. Last year, the U.S. produced an average of 63 billion cubic feet of natural gas per day, a 24 percent increase from 2006. But over that period consumption has grown half as fast. The nation's storage facilities could easily handle this extra supply until recently because cold winters pushed up demand for heating and hot summers led to higher demand for air conditioning. Just over half the nation's homes are heated with natural gas, and one-quarter of its electricity is produced by gas-fired power plants. But this past winter was the fourth warmest in the last 117 years, according to the National Oceanic and Atmospheric Administration. It was the warmest March since 1950. Between November and March, daily natural gas demand fell 5 percent, on average, from a year earlier, according to Bentek Energy. Yet production grew 8 percent over the same period. "We haven't ever seen a situation like this before," says Chris McGill, Vice President for Policy Analysis at the American Gas Association, an industry group. At the end of winter, there is usually about 1.5 trillion cubic feet of gas in storage. Today there is 2.5 trillion cubic feet because utilities withdrew far less than usual this past winter. There is 4.4 trillion cubic feet of natural gas storage capacity in the U.S. If full, that would be enough fuel to supply the country for about 2 months. If current production and consumption trends were to continue, Bentek estimates that storage facilities would be full on October 10. Storage capacity, which has grown by 15 percent over the past decade, cannot be built fast enough to address the rapidly expanding glut. And analysts note there is little financial incentive to build more anyway.

#### No link—LNG in the U.S. is inevitable and the link is linear at best

**Weeks, 5** (Jennifer, E: The Environmental Magazine, “Highly combustible: debating the risks and benefits of LNG,” Nov-Dec 2005, http://findarticles.com/p/articles/mi\_m1594/is\_6\_16/ai\_n15947809)

"Given the enormity of our energy needs, a segment of our supply has to come from LNG," says former U.S. Representative Philip Sharp, who served as Congressional chair of the National Commission on Energy Policy and is now president of Resources for the Future, an environmental think tank in Washington, D.C. "There's no way that cleaner sources add up to what we need, and gas is much cleaner than coal or oil. LNG should not become an excuse for failing to press forward on energy efficiency and renewable fuels, but we have to deal within the confines of our political and economic institutions, and changes in the energy system are incremental," says Sharp.

#### nuclear baseload power generation is distinct from natural gas peak generation

**CEEG**, Consumer Energy Education Group, **2006**

(“Managing Your Energy Costs”, http://manageenergycosts.com/ManagingCosts.html)

Electricity and Peak Demand

Since electricity cannot be effectively stored, electrical networks must instantaneously balance generation and load, i.e., supply must always equal demand. Therefore, there is a need to build for the peak because sufficient generation capacity must meet maximum instantaneous demand whenever it happens. Meeting varying demands requires a mix of generation capacity including base-load and peak-load generation.

Base-Load Generation vs. Peak-Load Generation

A base load generation unit is one that provides a steady flow of power regardless of total power demand by the grid. This unit runs all seasons except during the time when repairs or scheduled maintenance occur. Base-load plants usually run on low-cost fuels such as nuclear or coal and are massive enough to provide a majority of the power used by a grid. Therefore, these plants have high capital costs to build but low operating costs to run.

In contrast, peak-load units (also known as peakers) are power plants that generally run only when there is a high demand, known as peak demand, for electricity. In the U.S., this occurs in the afternoon, especially during the summer months when the air conditioning load is high. The time a peaker operates may be several hours a day to as little as a few hours per year. If a peaker is only going to be run for a short and variable time, it does not make economic sense to make it as efficient as a base-load power plant. Peak-load units are generally gas turbines that burn natural gas, which are more expensive than coal and nuclear. Therefore, peak-load systems tend to have low capital costs (so it is OK if it lying idle for most of the year) but high operating costs (but then, you don’t run it that often).

#### No Russia impact

**Story, 10/2/12** [Kathleen, Kate Story has had careers as a teacher and trainer, a computer analyst for an international corporation, and a licensed realtor in SC, NC, and FL in her thirty years of employment. She has  ECO certification from Asheville, is a member of the Green Building Council, buys and "greens" existing homes and promotes green building in the Greenville, SC area. She was an exhibitor at the annual Southern Energy & Environment Expo in Etowah, NC until its recent closing. its closing in 2011. She is an environmental and sustainability activist and member of Environmental Educators of NC,Green Building Products, and Bright Green Talent. Her current project is building a greenhouse with recycled glass bottles. Contact Kate at greenerbuilt1@gmail.com

 Russia vs United States in natural gas market”. <http://www.examiner.com/article/russia-vs-united-states-natural-gas-market>]

This October 2, 2012 morning, Russia's [Gazprom](http://www.gazprom.com) announced its signing of a contract for liquefied natural gas delivery to India's state-controlled GAIL (India) Ltd. for 20 years of 2.5 million tons per year. This news follows on the heels of reports that the United States with the hydraulic fracturing drilling process of its vast shale gas deposits was threatening Russian dominance on international gas markets.¶ Remember India's massive two day electric blackout in July 2012? Russia is now pursuing the booming Asian energy market. Unlike Russia and India, in the United States shale gas is not controlled by the government or any private company.The big controversy over the safety of [fracking](http://www.examiner.com/topic/fracking) and its environmental implications aside, the economic implications for the U.S., Russia and China are immense.¶ The expert on Russia at [Washington's Brookings Institution](http://www.brookings.edu/), Fiona Hill, says "Their days of dominating the European gas markets are gone." A summer 2012 report from Harvard University's [Kennedy School of Government](http://www.hks.harvard.edu/) stated, "The relative fortunes of the United States, Russia, and China -- and their ability to exert influence in the world -- are tied in no small measure to global gas developments."¶ In the U.S., the October 2012 price for gas is about three dollars per unit versus Russia's ten dollars for the large quantities of gas it has been exporting to Europe and other countries. Worldwide energy companies and politicians took notice since the profits for Russia's state-controlled Moscow-based [Gazprom](http://www.examiner.com/topic/gazprom/articles) energy corporation were $44 billion in 2011.¶ Russia had over 15 countries in Europe trying to find other energy sources in 2009 when a price payment dispute stopped Ukraine shipments for a couple weeks. Gazprom is the world's largest natural gas producer and exports it to other countries. Last month Gazprom said it couldn't justify investing in developing a new arctic gas field as profits dropped by nearly 25 percent.There were some rumors that Russia is secretly campaigning to stop the U.S. from taking over the natural gas market. Gazprom's head of export contracts and pricing, Sergei Komlev, in an email to the Associated Press admitted they were aware of decreasing dependence on Gazprom gas but do not expect U.S. abnormally low prices to last. He thanked the U.S. for being the "shale

#### Russian econ is resilient – budget flexibility, reserve funds, and falling ruble check total collapse

Jason Bush 7-2-2012; Reuters columnist, Oil-price slide highlights risks to Putin's Russia http://articles.economictimes.indiatimes.com/2012-07-02/news/32508636\_1\_oil-price-largest-oil-producer-peter-westin

Analysts say the impact on Russia of lower oil prices may be milder than during previous falls. "In the short term, in the next one to three years, we are fine," said Tchakarov. He noted that according to Finance Ministry calculations, every one dollar fall in the oil price means that the government loses around 55 billion roubles ($1.7 billion) in oil-related taxes over the course of a year. With the budget presently balancing at around $115 per barrel, an oil price of $90 per barrel, if sustained over a full year, would leave the government short to the tune of around $40 billion a year. But that is still just a fraction of the $185 billion that Russia has stashed away in two fiscal reserve funds, designed to stabilise the budget in just such an emergency. Even at $60 per barrel - the average oil price during the crisis year of 2009 - the reserve funds could cover the shortfall for about two years. "I find this worrying about the budget at this moment a little beside the point," said Clemens Grafe, chief Russia economist at Goldman Sachs. "The fiscal buffers they have to absorb this are going to be sufficient without cutting expenditure." Analysts also point out that since the previous financial crisis in 2008-2009, the central bank has radically changed the exchange rate regime, allowing the rouble to fall in line with the cheaper oil price. Since oil began its latest slide in mid-March, the rouble has lost around 15 percent of its value against the dollar. "The rouble weakened exactly in line with the oil price. And a weaker rouble is very good because it will secure the rouble equivalent of oil taxes for the budget," said Evgeny Gavrilenkov, chief economist at Troika Dialog.

#### Corruption inevitably crushes growth – and no short-term reforms will pass or be effectively implemented

Alexei Devyatov 6-15-2011; Chief Economist at URALSIB Capital, “ Russia Economy 2H11 Outlook: Reduced Impact of Oil on Russian Economic Growth” <http://www.bne.eu/story2735/Reduced_Impact_of_Oil_on_Russian_Economic_Growth>

We expect the Russian economy to grow about 4% on average in 2011-13 and starting from 2014, at 2-4%. Russia is an extremely interesting case. On the one hand, it has huge human capital and abundant natural resources. On the other hand, there is a lack of opportunities for transforming that potential into strong economic growth and prosperity. The main obstacles are an uncompetitive economy, an addiction to oil; poor demographics; weak institutions; and as a consequence, a poor investment climate. Administrative barriers make it more difficult for entrepreneurs to enter the market, which reduces competition and results in higher prices. The businesses suffer from pervasive corruption, which has effectively turned into unofficial tax burden in Russia. To attain rapid economic growth and prosperity, Russia needs to drastically improve its institutions, which means removing an entire class of corrupt officials. Unfortunately, over the last ten years, little has changed in terms of the quality of institutions, not least because those interested in maintaining the status quo have sufficient power to effectively block the reforms. Still we see the potential for gradual institutional changes as the government intensifies its efforts to fight corruption, to improve investment climate, and to modernize the economy

#### No impact to Russian economy

Blackwill, 09 – former associate dean of the Kennedy School of Government and Deputy Assistant to the President and Deputy National Security Advisor for Strategic Planning (Robert, RAND, “The Geopolitical Consequences of the World Economic Recession—A Caution”, http://www.rand.org/pubs/occasional\_papers/2009/RAND\_OP275.pdf, WEA)

Now on to Russia. Again, five years from today. Did the global recession and Russia’s present serious economic problems substantially modify Russian foreign policy? No. (President Obama is beginning his early July visit to Moscow as this paper goes to press; nothing fundamental will result from that visit). Did it produce a serious weakening of Vladimir Putin’s power and authority in Russia? No, as recent polls in Russia make clear. Did it reduce Russian worries and capacities to oppose NATO enlargement and defense measures eastward? No. Did it affect Russia’s willingness to accept much tougher sanctions against Iran? No. Russian Foreign Minister Lavrov has said there is no evidence that Iran intends to make a nuclear weapon.25 In sum, Russian foreign policy is today on a steady, consistent path that can be characterized as follows: to resurrect Russia’s standing as a great power; to reestablish Russian primary influence over the space of the former Soviet Union; to resist Western eff orts to encroach on the space of the former Soviet Union; to revive Russia’s military might and power projection; to extend the reach of Russian diplomacy in Europe, Asia, and beyond; and to oppose American global primacy. For Moscow, these foreign policy first principles are here to stay, as they have existed in Russia for centuries. 26 None of these enduring objectives of Russian foreign policy are likely to be changed in any serious way by the economic crisis.

### 2AC Nuclear Shephards K

#### The role of the ballot is to simulate the enactment of the plan --- debate is a game and that game requires the neg to prove that the entire plan is a bad idea – their framework creates a self-serving vision of the topic where they create goal posts, assert we don’t meet them and then suddenly they have assembled a coherent neg argument – that disincentives substantive debate and research

#### And, imagining scenarios, even if unlikely or flawed is a pre requisite to good analysis – the aff isn’t a research paper, just dismiss poorly constructed impacts

Wimbush, 08 – director of the Center for Future Security Strategies

(S. Enders, senior fellow at the Hudson Institute and the author of several books and policy articles, “A Parable: The U.S.-ROK Security Relationship Breaks Down”, Asia Policy, Number 5 (January 2008), 7-24)

What if the U.S.-ROK security relationship were to break down? This essay explores the alternative futures of such a scenario. **Analyzing scenarios is one technique** for trying to understand the increasing complexity of strategic environments. A scenario is **an account of an imagined sequence of events.** The intent of a scenario is to **suggest how alternative futures might arise** **and where they might lead**, where conflicts might occur, **how the interests of different actors** might be challenged, and the kinds of strategies actors might pursue to achieve their objectives. Important to keep in mind is that **scenarios are nothing more than** invented, in-depth stories—stories about what different futures could look like and what might happen along plausible pathways to those futures. The trends and forces that go into building a scenario **may be carefully researched,** yet a scenario is not a research paper. Rather, it is a work of the imagination. As such, scenarios are, first, **tools that can help bring order to the way analysts think** about what might happen in future security environments; **second**, scenarios are a provocative way of revealing possible dynamics of future security environments that might not be apparent simply by projecting known trends into the future. Scenarios are particularly useful in suggesting where the interests and actions of different actors might converge or collide with other forces, trends, attitudes, and influences. By using scenarios, to explore the question “what if this or that happened?” in a variety of different ways, with the objective of uncovering as many potential answers as possible, **analysts can build hedging strategies for dealing with many different kinds of potential problems**. Though they may choose to discount some of these futures and related scenarios, analysts will not be ignorant of the possibilities, with luck avoiding having to say: “I never thought about that.”

#### Permutation – do the plan and give up on the attempt to control nuclear technology. We build it and let it roam free to do as it pleases.

#### Plan creates a paradigm shift in resource usage that can foster global access to electricity without increasing structural violence

**Blees 9** [“Integral Fast Reactors for the masses”, Brave New Climate, Posted on 12 February 2009 on post by Barry Brook, Professor of Climate Change @ University of Adelaide, Tom Blees, National Center for Atmospheric Research]

Chris, advances in technology include very real advances in efficiency of our electrical devices, which is why California has been able to maintain a flat per capita electricity consumption for 30 years, and as someone who lives in California I can assure you that our efficiency is far from draconian, and that we could do a LOT better with little effort. There is no reason to believe that new technologies will cause us to require ever-greater amounts of electricity. On the contrary, in fact. Besides, you’re not going to get away from new technology, it’s an unstoppable evolutionary process (barring utter catastrophe). Watch Star Trek. Maybe it’ll give you a little more optimistic view.¶ Developing countries, however, will demand much more energy (electrical and otherwise) per person as they improve their standard of living. With IFR technology it shouldn’t be a problem providing it safely, economically, and cleanly. We needn’t go backwards, nor do we need to discourage every country from working toward a standard of living that those in the developed countries take for granted, just so long as we recycle everything as I describe in Prescription for the Planet. Between effortless recycling using plasma recyclers and power provided by IFRs, we can achieve standard of living fairness without being worried about running out of resources. I realize that breaking free of the zero-sum paradigm is a bit of a mind stretch, but it’s doable. That’s what P4TP is really all about: illuminating the path to a post-scarcity society. The technologies are only the tools to get there.¶ There is nothing particularly virtuous about a regression to some mythical “good old days.” And if we manage to utilize technologies that allow us to be even profligate consumers of energy (though that’s really not necessary) without damaging the environment or being unfair to our fellow man, that is not inherently a bad thing. There are a lot of mental constructs that will have to be re-examined in light of the sort of resource revolution I propose in my book. It won’t really matter if you drive around in a boron-powered zero-emission Hummer that’s made of garbage, what my son Shanti calls a “guilt-free car.” I urge you to read it not necessarily for the technological details but to get a picture of what the future could look like, a far brighter future than you might imagine.

#### No impact

Buchanan 7 [Allen, Professor of Philosophy and Public Policy at Duke, 2007, Preemption: military action and moral justification, pg. 128]

The intuitively plausible idea behind the 'irresponsible act' argument is that, other things being equal, the higher the stakes in acting and in particular the greater the moral risk, the higher are the epistemic requirements for justified action. The decision to go to war is generally a high stakes decision par excellence and the moral risks are especially great, for two reasons. First, unless one is justified in going to war, one's deliberate killing of enemy combatants will he murder, indeed mass murder. Secondly, at least in large-scale modem war, it is a virtual certainty that one will kill innocent people even if one is justified in going to war and conducts the war in such a way as to try to minimize harm to innocents. Given these grave moral risks of going to war, quite apart from often substantial prudential concerns, some types of justifications for going to war may simply be too subject to abuse and error to make it justifiable to invoke them. The 'irresponsible act' objection is not a consequentialist objection in any interesting sense. It does not depend upon the assumption that every particular act of going to war preventively has unacceptably bad consequences (whether in itself or by virtue of contributing lo the general acceptance of a principle allowing preventive war); nor does it assume that it is always wrong lo rely on a justification which, if generally accepted, would produce unacceptable consequences. Instead, the "irresponsible act' objection is more accurately described as an agent-centered argument and more particularly an argument from moral epistemic responsibility. The 'irresponsible act' objection to preventive war is highly plausible if— but only if—one assumes that the agents who would invoke the preventive-war justification are, as it were, on their own in making the decision to go to war preventively. In other words, the objection is incomplete unless the context of decision-making is further specified. Whether the special risks of relying on the preventive-war justification are unacceptably high will depend, inter alia, upon whether the decision-making process includes effective provisions for redu­cing those special risks. Because the special risks are at least in significant part epistemic—due to the inherently speculative character of the preventive war-justification—the epistemic context of the decision is crucial. Because institutions can improve the epistemic performance of agents, it is critical to know what the institutional context of the preventive-war decision is, before we can regard the 'irresponsible agent' objection as conclusive. Like the 'bad practice' argument, this second objection to preventive war is inconclusive because it does not consider— and rule out—the possibility that well-designed institutions for decision-making could address the problems that would otherwise make it irresponsible for a leader to invoke the preventive-war justification.

#### Nuke war outweighs structural violence – prioritizing structural violence makes preventing war impossible

Boulding 78 [Ken, is professor of economics and director, Center for Research on Conflict Resolution, University of Michigan, “Future Directions in Conflict and Peace Studies,” The Journal of Conflict Resolution, Vol. 22, No. 2 (Jun., 1978), pp. 342-354]

Galtung is very legitimately interested in problems of world poverty and the failure of development of the really poor. He tried to amalga- mate this interest with the peace research interest in the more narrow sense. Unfortunately, he did this by downgrading the study of inter- national peace, labeling it "negative peace" (it should really have been labeled "negative war") and then developing the concept of "structural violence," which initially meant all those social structures and histories which produced an expectation of life less than that of the richest and longest-lived societies. He argued by analogy that if people died before the age, say, of 70 from avoidable causes, that this was a death in "war"' which could only be remedied by something called "positive peace." Unfortunately, the concept of structural violence was broadened, in the word of one slightly unfriendly critic, to include anything that Galtung did not like. Another factor in this situation was the feeling, certainly in the 1960s and early 1970s, that nuclear deterrence was actually succeeding as deterrence and that the problem of nuclear war had receded into the background. This it seems to me is a most dangerous illusion and diverted conflict and peace research for ten years or more away from problems of disarmament and stable peace toward a grand, vague study of world developments, for which most of the peace researchers are not particularly well qualified. To my mind, at least, the quality of the research has suffered severely as a result.' The complex nature of the split within the peace research community is reflected in two international peace research organizations. The official one, the International Peace Research Association (IPRA), tends to be dominated by Europeans somewhat to the political left, is rather, hostile to the United States and to the multinational cor- porations, sympathetic to the New International Economic Order and thinks of itself as being interested in justice rather than in peace. The Peace Science Society (International), which used to be called the Peace Research Society (International), is mainly the creation of Walter Isard of the University of Pennsylvania. It conducts meetings all around the world and represents a more peace-oriented, quantitative, science- based enterprise, without much interest in ideology. COPRED, while officially the North American representative of IPRA, has very little active connection with it and contains within itself the same ideological split which, divides the peace research community in general. It has, however, been able to hold together and at least promote a certain amount of interaction between the two points of view. Again representing the "scientific" rather than the "ideological" point of view, we have SIPRI, the Stockholm International Peace Research Institute, very generously (by the usual peace research stand- ards) financed by the Swedish government, which has performed an enormously useful service in the collection and publishing of data on such things as the war industry, technological developments, arma- ments, and the arms trade. The Institute is very largely the creation of Alva Myrdal. In spite of the remarkable work which it has done, how- ever, her last book on disarmament (1976) is almost a cry of despair over the folly and hypocrisy of international policies, the overwhelming power of the military, and the inability of mere information, however good, go change the course of events as we head toward ultimate ca- tastrophe. I do not wholly share her pessimism, but it is hard not to be a little disappointed with the results of this first generation of the peace research movement. Myrdal called attention very dramatically to the appalling danger in which Europe stands, as the major battleground between Europe, the United States, and the Soviet Union if war ever should break out. It may perhaps be a subconscious recognition-and psychological denial-of the sword of Damocles hanging over Europe that has made the European peace research movement retreat from the realities of the international system into what I must unkindly describe as fantasies of justice. But the American peace research community, likewise, has retreated into a somewhat niggling scientism, with sophisticated meth- odologies and not very many new ideas. I must confess that when I first became involved with the peace research enterprise 25 years ago I had hopes that it might produce some- thing like the Keynesian revolution in economics, which was the result of some rather simple ideas that had never really been thought out clearly before (though they had been anticipated by Malthus and others), coupled with a substantial improvement in the information system with the development of national income statistics which rein- forced this new theoretical framework. As a result, we have had in a single generation a very massive change in what might be called the "conventional wisdom" of economic policy, and even though this conventional wisdom is not wholly wise, there is a world of difference between Herbert Hoover and his total failure to deal with the Great Depression, simply because of everybody's ignorance, and the moder- ately skillful handling of the depression which followed the change in oil prices in 1-974, which, compared with the period 1929 to 1932, was little more than a bad cold compared with a galloping pneumonia. In the international system, however, there has been only glacial change in the conventional wisdom. There has been some improvement. Kissinger was an improvement on John Foster Dulles. We have had the beginnings of detente, and at least the possibility on the horizon of stable peace between the United States and the Soviet Union, indeed in the whole temperate zone-even though the tropics still remain uneasy and beset with arms races, wars, and revolutions which we cannot really afford. Nor can we pretend that peace around the temper- ate zone is stable enough so that we do not have to worry about it. The qualitative arms race goes on and could easily take us over the cliff. The record of peace research in the last generation, therefore, is one of very partial success. It has created a discipline and that is something of long-run consequence, most certainly for the good. It has made very little dent on the conventional wisdom of the policy makers anywhere in the world. It has not been able to prevent an arms race, any more, I suppose we might say, than the Keynesian economics has been able to prevent inflation. But whereas inflation is an inconvenience, the arms race may well be another catastrophe. Where, then, do we go from here? Can we see new horizons for peace and conflict research to get it out of the doldrums in which it has been now for almost ten years? The challenge is surely great enough. It still remains true that war, the breakdown of Galtung's "negative peace," remains the greatest clear and present danger to the human race, a danger to human survival far greater than poverty, or injustice, or oppression, desirable and necessary as it is to eliminate these things. Up to the present generation, war has been a cost and an inconven- ience to the human race, but it has rarely been fatal to the process of evolutionary development as a whole. It has probably not absorbed more than 5% of human time, effort, and resources. Even in the twenti- eth century, with its two world wars and innumerable smaller ones, it has probably not acounted for more than 5% of deaths, though of course a larger proportion of premature deaths. Now, however, advancing technology is creating a situation where in the first place we are developing a single world system that does not have the redundancy of the many isolated systems of the past and in which therefore if any- thing goes wrong everything goes wrong. The Mayan civilization could collapse in 900 A.D., and collapse almost irretrievably without Europe or China even being aware of the fact. When we had a number of iso- lated systems, the catastrophe in one was ultimately recoverable by migration from the surviving systems. The one-world system, therefore, which science, transportation, and communication are rapidly giving us, is inherently more precarious than the many-world system of the past. It is all the more important, therefore, to make it internally robust and capable only of recoverable catastrophes. The necessity for stable peace, therefore, increases with every improvement in technology, either of war or of peacex

#### Tech-optimism is good if we win our tech is probably true

Krier 85 (James E., Professor of Law at the University of Michigan, “The Un-Easy Case for Technological Optimism,” Michigan Law Review, Vol. 84, No. 3; December 1985, pp. 405-429)

A technological optimist is **not** simply **a person with unqualified enthusiasm about technological promise**. Saint-Simon (1760-1825) was an enthusiast, but he was not a technological optimist as the term is currently used. Saint-Simon, rather, was a utopian who happened to attach his vision to technocratic expertise.4 He was the forefather of Technocracy, an active utopian movement in the 1930s and one not entirely dead even today.5 Technological optimists are not utopians, but something less - let us say quasi-utopians, after a recent usage (applied to himself) of Robert Dahl's.6 Unlike any self-respecting pure utopian, quasi-utopians (and technological optimists) seek not perfection but **tolerable imperfection**, tolerable because it is better than anything else they consider attainable though not nearly as good as lots of alternatives that can be imagined. But technological optimists are also something more than mere be- lievers, or faddists, or techniks.7 Their views are rigorously formulated, grounded in an apparent reality, based on knowledge and experience, and artfully defended. There are no crazies among the best of the optimists; they are **conservative, respected experts who command enormous authority**. They have a very specific position namely, "that exponential technological growth will allow us to expand resources ahead of exponentially increasing demands."8

#### US won’t do more mindless interventions

Mandelbaum 11 (Michael Mandelbaum, A. Herter Professor of American Foreign Policy, the Paul H. Nitze School of Advanced International Studies, Johns Hopkins University, Washington DC; and Director, Project on East-West Relations, Council on Foreign Relations, “CFR 90th Anniversary Series on Renewing America: American Power and Profligacy,” Jan 2011) <http://www.cfr.org/publication/23828/cfr_90th_anniversary_series_on_renewing_america.html?cid=rss-fullfeed-cfr_90th_anniversary_series_on-011811&utm_source=feedburner&utm_medium=feed&utm_campaign=Feed:+cfr_main+(CFR.org+-+Main+Site+Feed>

MANDELBAUM: I think it is, Richard. And I think that this period really goes back two decades. I think the wars or the interventions in Somalia, in Bosnia, in Kosovo, in Haiti belong with the interventions in Afghanistan and Iraq, although they were undertaken by different administrations for different reasons, and had different costs. But all of them ended up in the protracted, unexpected, unwanted and expensive task of nation building. Nation building has never been popular. The country has never liked it. It likes it even less now. And I think we're not going to do it again. We're not going to do it because there won't be enough money. We're not going to do it because there will be other demands on the public purse. We won't do it because we'll be busy enough doing the things that I think ought to be done in foreign policy. And we won't do it because it will be clear to politicians that the range of legitimate choices that they have in foreign policy will have narrowed and will exclude interventions of that kind. So I believe and I say in the book that the last -- the first two post-Cold War decades can be seen as a single unit. And that unit has come to an end.

## 1ar

### Co2

#### Limiting factors outweigh

* Nitrogen
* Water

**Chandler and Lepage 7** – David Chandler, is currently Bruce Mahan Professor of Chemistry at the University of California, Berkeley.  He received his S.B. degree in Chemistry from MIT in 1966, and his Ph.D. in Chemical Physics at Harvard in 1969.   He began his academic career as an Assistant Professor in 1970 at the Urbana-Champaign campus of the University of Illinois, rising through the ranks to become a full Professor in 1977. Prior to joining the Berkeley faculty in 1986, Chandler spent two years as Professor of Chemistry at the University of Pennsylvania AND \*Michael Lepage, Master of Science, Atmospheric Science, Texas Tech University, 1981, Bachelor of Science, Mathematics, McGill University, Montreal, 1979 (“Climate myths: Higher CO2 levels will boost plant growth and food production”, <http://environment.newscientist.com/channel/earth/climate-change/dn11655>) Jacome

However, while experiments on natural ecosystems have also found initial elevations in the rate of plant growth, these have tended to level off within a few years. In most cases this has been found to be the result of some other limiting factor, such as the availability of nitrogen or water. The regional climate changes that higher CO2 will bring, and their effect on these limiting factors on plant growth, such as water, also have to be taken into account. These indirect effects are likely to have a much larger impact than CO2 fertilisation. For instance, while higher temperatures will boost plant growth in cooler regions, in the tropics they may actually impede growth. A two-decade study of rainforest plots in Panama and Malaysia recently concluded that local temperature rises of more than 1ºC have reduced tree growth by 50 per cent (see Don't count on the trees). Another complicating factor is ground level ozone due to air pollution, which damages plants. This is expected to rise in many regions over the coming decades and could reduce or even negate the beneficial effects of higher CO2 (see Climate change warning over food production). In the oceans, increased CO2 is causing acidification of water. Recent research has shown that the expected doubling of CO2 concentrations could inhibit the development of some calcium-shelled organisms, including phytoplankton, which are at the base of a large and complex marine ecosystem (see Ocean acidification: the other CO2 problem). That may also result in significant loss of biodiversity, possibly including important food species.

#### That means that co2 is useless

**Stankus 9** – Life Sciences Librarian & Professor University of Arkansas Libraries(Tony, February 4th “Will Global Warming & Increased CO2 Increase Crop Yields?, <http://sla-divisions.typepad.com/dbio/2009/02/will-global-warming-increased-co2-increase-crop-yields.html>) Jacome

One of the few upsides found when exploring global warming scenarios is based on the assumption that since green plants thrive on carbon dioxide (and there will be much more of it) for photosynthesis and since warmth tends more than cold to promote growth (and there will be more warmth), farmers who grow green plant crops should, on the whole, thrive. This hypothesis has been tested in greenhouses with generally positive confirmations. The problem with this overall proposition is that it has run counter to recent experience for most countries and crops, with China and plantains being notable exceptions. There is substantial agreement that world yields of wheat, rice, and corn (maize), as well as soybeans **are trending down with increases in atmospheric CO2** and warmth. Why would this be so? Having More CO2 May Not Be All That Helpful If Other Inputs Do Not Match It Having **more CO2 may not help plants** if they do not have access to increased water, nitrogen, potash, and the right soil conditions, at the same time. It’s something like having more flour. By itself, more flour does not mean you can bake a bigger cake. You also have to have baking powder, shortening, eggs, water, and other ingredients, or you are just going to get a modestly risen but pasty lump of dough.

#### No risk of offense – plants have acclimated to low levels of co2

**Tissue and Lewis 12 –** international expert on the effects of climate change on ecosystems, He has worked at Free Air CO2 Exchange (FACE) sites, University of Western Sydney, [Hawkesbury Institute for the Environment](http://www.uws.edu.au/hie) and James, PhD Fordham University in Biological Studies, (David, February 24th, 2012. “Learning from the past: how low [CO2] studies inform plant and ecosystem response to future climate change”, http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04081.x/full)

Low [CO2] has been proposed as a strong evolutionary selective agent, including contributing to the origin of agriculture ([Sage, 1995](http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04081.x/full#b11)) and the evolution of C4 plants in association with high temperature and drought ([Osborne & Sack, 2012](http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04081.x/full#b8)). More specifically, low [CO2] has generated substantial changes in leaf traits associated with CO2 and water exchange, such as reduced stomatal density, greater vein density and megaphyll leaves (see review by [Leakey & Lau, 2012).](http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04081.x/full#b5) Given the duration of very low [CO2] over geologic time and the relatively recent rise in [CO2] over the past 20 000 yr, selection pressure must have been strongly exerted by low [CO2]. For example, [Ward*et al.* (2000)](http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04081.x/full#b15) found that biomass production in *Arabidopsis* was increased 35% after only five generations of selection in low [CO2], but not at high [CO2], suggesting rapid and strong selective effects in low [CO2]. It is therefore, reasonable to assume that plants are still adapted to low [CO2], which may constrain responses to rising [CO2] predicted to occur over the next century ([Sage & Coleman, 2001](http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04081.x/full#b12)).

In a future warmer, high [CO2] world, the primary resource limiting plant function will continue to transition from [CO2] to other resources, such as temperature, nutrients and water availability. In controlled environment studies to date, there is little evidence that adaptive evolutionary responses to elevated [CO2] have occurred, even over many generations, despite changes in plant phenotypes ([Leakey & Lau, 2012](http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04081.x/full#b5)). Longer term exposure (thousands of years) to elevated [CO2] at natural CO2 springs also generally find minimal adaptive change despite some alterations in photosynthetic performance and biochemistry (e.g. [Cook *et al.*, 1998](http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04081.x/full#b1)). Interestingly, even the evolution of Rubisco appears constrained, with Rubisco specificity optimal for light-saturated photosynthesis at *c*. 200 ppm [CO2] ([Zhu *et al.*, 2004](http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04081.x/full#b17)), which is the mean [CO2] over the last 400 000 yr ([Luthi *et al.*, 2008](http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04081.x/full#b7)). A potential explanation for the general lack of evidence for adaptive responses to elevated [CO2] is that (e.g. nutrient, water, temperature) over multiple generations ([Leakey & Lau, 2012](http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04081.x/full#b5)). Given that these environmental conditions co-vary, and that selection is strongest under stressful conditions, this research direction should be pursued in the near future.

Reduced terrestrial carbon storage, net primary production and forest cover during glacial periods, which are characterized by very low atmospheric [CO2], may be more accurately predicted when the impact of low [CO2] on physiological processes is included in palaeoclimate models ([Prentice & Harrison, 2009](http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04081.x/full#b9)). Utilizing findings from studies that address the impact of low [CO2] on physiological performance in C3 and C4 plants, it has been demonstrated that physiological effects may scale up to the ecosystem level ([Prentice & Harrison, 2009](http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04081.x/full#b9)). For example, changes in [CO2] and their resultant effect on plant photosynthesis and water use efficiency in low [CO2] have been used to accurately explain changes in the composition of plant communities (C3 vs C4) over the LGM, as well as account for changes in the woody component in savannas, relative forest cover, and most recently tree–grass competition during the transition from LGM to pre-industrial Holocene ([Prentice *et al.*, 2011](http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04081.x/full#b10)). Overall, we should utilize our improved understanding of plant adaptation and response to low and variable [CO2] over historic time periods to better predict ecosystem response to rising [CO2] and future climate change.

#### CO2 kills soil nutrients that makes ag impossible

**Erickson 92** – Department of Agricultural Economics, Cornell University [Jon, “From Ecology to economics: the case against CO2 fertilization,” Ecological Economics, 8 (1993) 157-175]

The efficiency of phosphorus use, a critical element in the molecules that transfer energy during photosynthesis, is not expected to rise in response to increased CO2 concentration. Thus the amount of phosphorous demanded by plants rises in direct proportion to the reaction rate and the CO2 uptake (Pitelka, 1992). In CO2 enrichment experiments with phosphorus shortage, the consistent response was **no CO2 effect at all** (Goudriaan and de Ruiter 1983).

Current trends in soil depletion and future possibilities of frequent flooding place natural limits on essential soil nutrients. Kimball (1985) concludes that nutrient fertilization must increase in proportion to CO2 yield enhancement to obtain maximum benefit from higher CO2 concentrations. The production of fertilizers is highly dependent on burning fossil fuels, further aggrevating the greenhouse effect. Optimal fertilization occurs where the value of marginal product of fertilizer equals the price of the fertilizer. Future levels of fertilizers will be determined by how marginal product of fertilizer, crop price, and fertilizer price change, not solely by potential benefits from higher CO2 concentrations. Furthermore, applying fertilizers is of little consolation to poorer farms with limits on both natural soils and funds for fertilizers. The MINK study (stockle et al., 1992b) and EPA studies (Smith and Tirpak, 1988) assumed nutrients to be non-limiting, a useful simplification, but an unrealistic one considering the dependency of the CO2 effect on phosphorus and nitrogen, and the probability of future nutrient constraints.

Thus increased CO2 concentrations do not necessarily result in increased crop yields. Cline (1992, p. 91) concludes, “it would seem risky to count on agriculture in general experiencing the same degree of benefits from carbon fertilization as had been discovered in the laboratory experiments, especially in developing countries where complementary water and fertilizers may be lacking.” Korner and Arnone III (1992) studied the carbon, nutrient, and water balance of a tropical ecosystem and found no significant growth response to CO2 enhancement. They emphasize the “inadequacy” of fertilization modeling and stress the “urgent need for whole-system experimental approaches in global-change research.” Indeed, CO2 fertilization is highly contingent upon ideal conditions in a non-ideal world. Its magnitude demonstrated in controlled settings with professional plant scientists at hand would not be realized in actual fields with actual managerial ability, actual farm-level funds, and current trends in soil depletion and water scarcity.

### Avery Indict

#### Avery is a liar too

**Daily Green 8** [1.11.2008, “Who's Who on Inhofe's List of 400 Global Warming Deniers”,]

Dennis Avery. Not a scientist...he is director of the Center for Global Food Issues at the Hudson Institute, which receives funding from Exxon, Dupont, Monsanto and so on.

http://www.sourcewatch.org/index.php?title=Dennis\_Avery

#### Prefer our science – their evidence is based on biased studies

**Attavanich and McCarl 11**, Witsanu, Ph.D. Candidate Department of Agricultural Economics, Texas A&M University, College Station Instructor Department of Economics, Kasetsart University, Thailand, Bruce A, Distinguished and Regents Professor Department of Agricultural Economics, Texas A&M University [“The Effect of Climate Change, CO2 Fertilization, and Crop Production Technology on Crop Yields and Its Economic Implications on Market Outcomes and Welfare Distribution,” July 24th, http://ageconsearch.umn.edu/bitstream/103324/2/SelectedPaper\_Effect%20of%20Climate%20Change%20CO2%20and%20Technology%20on%20crop%20yield.pdf]

Early studies related to the response of crop yield to atmospheric carbon dioxide (CO2) were reviewed by IPCC (2007) (see for example, Parry et al. 2004). Their amassed evidence suggests that the crop yield reduction induced by climate change will be offset by the direct fertilization effect of rising CO2 concentrations. However, almost all of information about crop responses to elevated CO2 from early studies is obtained from studies in controlled-environment chambers where released CO2 may be retained and easily controlled, which has been argued to be an upwardly biased measure of the response of crop yields to elevated CO2 (Long et al. 2006). Recent studies (see for example, Ottman et al. 2001; Ainsworth and Long 2005; Leakey 2009) are of the FACE type. Long et al. (2006) show that for each crop, the stimulation of yield observed in FACE experiments was well below (about half) that predicted from chambers. They reveal that, across FACE studies, that yields of C-3 crops soybean and wheat increase by about 14 and 13 percent, respectively at 550 part per million of CO2 relative to ambient CO2, while they find no significant relationship between yields of C-4 crops and CO2. Moreover, Leakey (2009) finds that unlike C-3 crops, for which there is a direct enhancement of photosynthesis by elevated CO2, C-4 crops only benefit from elevated CO2 in times and places of drought stress. Kimball (2006) analyzed data from the FACE studies and found an increase in yields of cotton, wheat, and sorghum at elevated CO2 relative to ambient CO2. Under ample water, the values range from 21-81 percent for cotton, 8-17 percent for wheat, and -11-1 percent for sorghum, while under lower water, values range from 50-51 percent for cotton, 5-12 percent for wheat, and 17-34 percent for sorghum. Amthor (2001) reviews fifty studies from both FACE and chamber studies and concludes that elevated CO2 stimulates yield of water-stressed wheat, but usually does not fully compensate for water shortage. Studies project the change in future crop yield induced by climate change using climate projections from global circulation models (GCMs). Huang and Khanna (2010) find that with 6C increases in temperature, yields of corn, soybeans, and wheat are projected to decrease 45, 42, and 26 percent, respectively, in 2100. Using climate projections from Hadley GCM, in the medium term (2020-2049), Schlenker and Roberts (2009) find that yields are projected to decrease about 20-30% for corn, 15-25% for soybeans and 20-25% for cotton. Using Hadley and Canadian GCMs, McCarl, Villavicencio, and Wu (2008) find that generally in 2030 yields of all crops except sorghum are increased regarding to the projected standard deviation of temperature. Similar to above mentioned studies, our study will project the change in future crop. This study will employ four of the most recent GCMs to reflect the uncertainty inherent in such projections.

### AT: Prolif Good

#### Proliferation will be rapid and escalate – kills stability – multiple reasons.

**Horowitz, 2009**

[April, Michael, Department of Political Science, University of Pennsylvania, Philadelphia, “The Spread of Nuclear Weapons,” journal of conflict resolution, vol 53, no 2]

Learning as states gain experience with nuclear weapons is complicated. While to some extent, nuclear acquisition might provide information about resolve or capabil-  ities, it also generates uncertainty about the way an actual conflict would go—given  the new risk of nuclear escalation—and uncertainty about relative capabilities. Rapid proliferation may especially heighten uncertainty given the potential for reasonable  states to disagree at times about the quality of the capabilities each possesses.2 What  follows is an attempt to describe the implications of inexperience and incomplete  information on the behavior of nuclear states and their potential opponents over time.  Since it is impossible to detail all possible lines of argumentation and possible  responses, the following discussion is necessarily incomplete. This is a first step.  The acquisition of nuclear weapons increases the confidence of adopters in their  ability to impose costs in the case of a conflict and the expectations of likely costs if  war occurs by potential opponents. The key questions are whether nuclear states  learn over time about how to leverage nuclear weapons and the implications of that  learning, along with whether actions by nuclear states, over time, convey information  that leads to changes in the expectations of their behavior—shifts in uncertainty—  on the part of potential adversaries.  Learning to Leverage?  When a new state acquires nuclear weapons, how does it influence the way the  state behaves and how might that change over time? Although nuclear acquisition  might be orthogonal to a particular dispute, it might be related to a particular secu-  rity challenge, might signal revisionist aims with regard to an enduring dispute, or  might signal the desire to reinforce the status quo.  This section focuses on how acquiring nuclear weapons influences both the new  nuclear state and potential adversaries. In theory, system wide perceptions of nuclear  danger could allow new nuclear states to partially skip the early Cold War learning  process concerning the risks of nuclear war and enter a proliferated world more cog-  nizant of nuclear brinksmanship and bargaining than their predecessors. However,  each new nuclear state has to resolve its own particular civil–military issues surrounding operational control and plan its national strategy in light of its new capa-  bilities. Empirical research by Sagan (1993), Feaver (1992), and Blair (1993)  suggests that viewing the behavior of other states does not create the necessary tacit  knowledge; there is no substitute for experience when it comes to handling a nuclear  arsenal, even if experience itself cannot totally prevent accidents. Sagan contends  that civil–military instability in many likely new proliferators and pressures generated by the requirements to handle the responsibility of dealing with nuclear weapons  will skew decision making toward more offensive strategies (Sagan 1995). The ques-  tions surrounding Pakistan’s nuclear command and control suggest there is no magic  bullet when it comes to new nuclear powers’ making control and delegation decisions (Bowen and Wolvén 1999).  Sagan and others focus on inexperience on the part of new nuclear states as a key  behavioral driver. Inexperienced operators and the bureaucratic desire to “justify”  the costs spent developing nuclear weapons, combined with organizational biases  that may favor escalation to avoid decapitation—the “use it or lose it” mind-set—  may cause new nuclear states to adopt riskier launch postures, such as launch on  warning, or at least be perceived that way by other states (Blair 1993; Feaver 1992;  Sagan 1995).3  Acquiring nuclear weapons could alter state preferences and make states more  likely to escalate disputes once they start, given their new capabilities.4 But their  general lack of experience at leveraging their nuclear arsenal and effectively communicating nuclear threats could mean new nuclear states will be more likely to  select adversaries poorly and to find themselves in disputes with resolved adver-  saries that will reciprocate militarized challenges. The “nuclear experience” logic also suggests that more experienced nuclear states  should gain knowledge over time from nuclearized interactions that helps leaders  effectively identify the situations in which their nuclear arsenals are likely to make  a difference. Experienced nuclear states learn to select into cases in which their com-  parative advantage, nuclear weapons, is more likely to be effective, increasing the  probability that an adversary will not reciprocate.  Coming from a slightly different perspective, uncertainty about the consequences  of proliferation on the balance of power and the behavior of new nuclear states on  the part of their potential adversaries could also shape behavior in similar ways (Schelling 1966; Blainey 1988). While a stable and credible nuclear arsenal communicates clear information about the likely costs of conflict, in the short term,  nuclear proliferation is likely to increase uncertainty about the trajectory of a war,  the balance of power, and the preferences of the adopter.

### 1ar a2 slow prolif

#### There’s an abrupt cliff and we still access slow escalation

Tellis 2002 – senior advisor to the US Ambassador in New Delhi, SSP supporter and true patriot (Ashley, Orbis, 46.1, “The strategic implications of a nuclear India”)

While this posture augurs well for crisis stability where sudden emergencies are concerned, it becomes less relevant when long intervals of strategic warning are available or when a crisis evolves slowly. Under these circumstances, the nuclear capabilities in all the relevant states would progressively increase in readiness depending on the rate at which strategic components are alerted, integrated (if necessary), and mobilized in accordance with preplanned contingency procedures. Once such activities are under way, the relatively low peacetime readiness of the various strategic forces would no longer provide crisis stability, because operational dormancy disappears irrevocably once the process of strategic alerting is completed.

### Counterplan

#### Changing ocean current patterns risks reaching tipping points

**Ice melting alone is enough to cause tipping points**

**Brown, 8** – Director and Founder of the global institute of Environment in the U.S.

 [Lester E. Brown, “Plan B 3.0: Mobilizing to Save Civilization”]

Scientists are concerned that "positive feedback loops" may be starting to kick in. This term refers to a situation where a trend already under way begins to reinforce itself. Two of these potential feedback mechanisms are of particular concern to sci­entists. The first, in the Arctic, is the albedo effect. When incoming sunlight strikes the ice in the Arctic Ocean, up to 70 percent of it is reflected back into space. Only 30 percent is absorbed as heat. As the Arctic sea ice melts, however, and the incoming sunlight hits the much darker open water, only 6 per­cent is reflected back into space and 94 percent is converted into heat. This may account for the **accelerating shrinkage of the Arctic sea ice** and the rising regional temperature that directly affects the Greenland ice sheet.42 If all the ice in the Arctic Ocean melts, it will not affect sea level because the ice is already in the water. But it will lead to a much warmer Arctic region as more of the incoming sunlight is absorbed as heat. This is of particular concern because Green­land lies largely within the Arctic Circle. As the Arctic region warms, the island's ice sheet-up to 1.6 kilometers (1 mile) thick in places-is beginning to melt.43 The second positive feedback mechanism also has to do with ice melting. What scientists once thought was a fairly simple lin­ear process-that is, a certain amount at the surface of an ice sheet melts each year, depending on the temperature-is now seen to be much more complicated. As the surface ice begins to melt, some of the water filters down through cracks in the glacier, lubricating the surface between the glacier and the rock beneath it. This accelerates the glacial flow and the calving of icebergs into the surrounding ocean. The relatively warm water flowing through the glacier also carries surface heat deep inside the ice sheet far faster than it would otherwise penetrate by sim­ple conduction ;"! Several recent studies report that the melting of the Green­land ice sheet is accelerating.