# Mo State v Michigan – round 2 AFF

## 1AC

### 1AC prolif advantage

#### ADVANTAGE:\_\_ proliferation

#### Rapid cascade proliferation at the tipping point.

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THE GLOBAL nuclear order today could be as fragile as the global financial order was two years ago, when conventional wisdom declared it to be sound, stable, and resilient. In the aftermath of the 1962 Cuban missile crisis, a confrontation that he thought had one chance in three of ending in nuclear war, U.S. President John F. Kennedy concluded that the nuclear order of the time posed unacceptable risks to mankind. "I see the possibility in the 1970s of the president of the United States having to face a world n which 15 or 20 or 25 nations may have these weapons," he forecast. "I regard that as the greatest possible danger." Kennedy's estimate reflected the general expectation that as nations acquired the advanced technological capability to build nuclear weapons, they would do so. Although history did not proceed along that trajectory, Kennedy's warning helped awaken the world to the intolerable dangers of unconstrained nuclear proliferation. His conviction spurred a surge of diplomatic initiatives: a hot line between Washington and Moscow, a unilateral moratorium on nuclear testing, a ban on nuclear weapons in outer space. Refusing to accept the future Kennedy had spotlighted, the international community instead negotiated various international constraints, the centerpiece of which was the 1968 Nuclear Nonproliferation Treaty (NPT). Thanks to the nonproliferation regime, 184 nations, including more than 40 that have the technical ability to build nuclear arsenals, have renounced nuclear weapons. Four decades since the NPT was signed, there are only nine nuclear states. Moreover, for more than 60 years, no nuclear weapon has been used in an attack. In 2004, the secretary-general of the UN created a panel to review future threats to international peace and security. It identified nuclear Armageddon as the prime threat, warning, "We are approaching a point at which the erosion of the nonproliferation regime could become irreversible and result in a cascade of proliferation." Developments since 2004 have only magnified the risks of an irreversible cascade. The current global nuclear order is extremely fragile, and the three most urgent challenges to it are North Korea, Iran, and Pakistan. If North Korea and Iran become established nuclear weapons states over the next several years, the nonproliferation regime will have been hollowed out. If Pakistan were to lose control of even one nuclear weapon that was ultimately used by terrorists, that would change the world. It would transform life in cities, shrink what are now regarded as essential civil liberties, and alter conceptions of a viable nuclear order. Henry Kissinger has noted that the defining challenge for statesmen is to recognize "a change in the international environment so likely to undermine a nation's security that it must be resisted no matter what form the threat takes or how ostensibly legitimate it appears." The collapse of the existing nuclear order would constitute just such a change and the consequences would make nuclear terrorism and nuclear war so imminent that prudent statesmen must do everything feasible to prevent it.

#### Proliferation causes nuclear war and extinction – deterrence fails for three reasons.

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The spread of nuclear weapons poses a number of severe threats to international peace and U.S. national security including: nuclear war, nuclear terrorism, emboldened nuclear powers, constrained freedom of action, weakened alliances, and further nuclear proliferation. This section explores each of these threats in turn. Nuclear War. The greatest threat posed by the spread of nuclear weapons is nuclear war. The more states in possession of nuclear weapons, the greater the probability that somewhere, someday, there is a catastrophic nuclear war. A nuclear exchange between the two superpowers during the Cold War could have arguably resulted in human extinction and a nuclear exchange between states with smaller nuclear arsenals, such as India and Pakistan, could still result in millions of deaths and casualties, billions of dollars of economic devastation, environmental degradation, and a parade of other horrors. To date, nuclear weapons have only been used in warfare once. In 1945, the United States used one nuclear weapon each on Hiroshima and Nagasaki, bringing World War II to a close. Many analysts point to sixty-five-plus-year tradition of nuclear non-use as evidence that nuclear weapons are unusable, but it would be naïve to think that nuclear weapons will never be used again. After all, analysts in the 1990s argued that worldwide economic downturns like the great depression were a thing of the past, only to be surprised by the dot-com bubble bursting in the later 1990s and the Great Recession of the late Naughts. [53] This author, for one, would be surprised if nuclear weapons are not used in my lifetime. Before reaching a state of MAD, new nuclear states go through a transition period in which they lack a secure-second strike capability. In this context, one or both states might believe that it has an incentive to use nuclear weapons first. For example, if Iran acquires nuclear weapons neither Iran, nor its nuclear-armed rival, Israel, will have a secure, second-strike capability. Even though it is believed to have a large arsenal, given its small size and lack of strategic depth, Israel might not be confident that it could absorb a nuclear strike and respond with a devastating counterstrike. Similarly, Iran might eventually be able to build a large and survivable nuclear arsenal, but, when it first crosses the nuclear threshold, Tehran will have a small and vulnerable nuclear force. In these pre-MAD situations, there are at least three ways that nuclear war could occur. First, the state with the nuclear advantage might believe it has a splendid first strike capability. In a crisis, Israel might, therefore, decide to launch a preemptive nuclear strike to disarm Iran’s nuclear capabilities and eliminate the threat of nuclear war against Israel. Indeed, this incentive might be further increased by Israel’s aggressive strategic culture that emphasizes preemptive action. Second, the state with a small and vulnerable nuclear arsenal, in this case Iran, might feel use ‘em or loose ‘em pressures. That is, if Tehran believes that Israel might launch a preemptive strike, Iran might decide to strike first rather than risk having its entire nuclear arsenal destroyed. Third, as Thomas Schelling has argued, nuclear war could result due to the reciprocal fear of surprise attack.[54] If there are advantages to striking first, one state might start a nuclear war in the belief that war is inevitable and that it would be better to go first than to go second. In a future Israeli-Iranian crisis, for example, Israel and Iran might both prefer to avoid a nuclear war, but decide to strike first rather than suffer a devastating first attack from an opponent. Even in a world of MAD, there is a risk of nuclear war. Rational deterrence theory assumes nuclear-armed states are governed by rational leaders that would not intentionally launch a suicidal nuclear war. This assumption appears to have applied to past and current nuclear powers, but there is no guarantee that it will continue to hold in the future. For example, Iran’s theocratic government, despite its inflammatory rhetoric, has followed a fairly pragmatic foreign policy since 1979, but it contains leaders who genuinely hold millenarian religious worldviews who could one day ascend to power and have their finger on the nuclear trigger. We cannot rule out the possibility that, as nuclear weapons continue to spread, one leader will choose to launch a nuclear war, knowing full well that it could result in self-destruction. One does not need to resort to irrationality, however, to imagine a nuclear war under MAD. Nuclear weapons may deter leaders from intentionally launching full-scale wars, but they do not mean the end of international politics. As was discussed above, nuclear-armed states still have conflicts of interest and leaders still seek to coerce nuclear-armed adversaries. This leads to the credibility problem that is at the heart of modern deterrence theory: how can you threaten to launch a suicidal nuclear war? Deterrence theorists have devised at least two answers to this question. First, as stated above, leaders can choose to launch a limited nuclear war.[55] This strategy might be especially attractive to states in a position of conventional military inferiority that might have an incentive to escalate a crisis quickly. During the Cold War, the United States was willing to use nuclear weapons first to stop a Soviet invasion of Western Europe given NATO’s conventional inferiority in continental Europe. As Russia’s conventional military power has deteriorated since the end of the Cold War, Moscow has come to rely more heavily on nuclear use in its strategic doctrine. Indeed, Russian strategy calls for the use of nuclear weapons early in a conflict (something that most Western strategists would consider to be escalatory) as a way to de-escalate a crisis. Similarly, Pakistan’s military plans for nuclear use in the event of an invasion from conventionally stronger India. And finally, Chinese generals openly talk about the possibility of nuclear use against a U.S. superpower in a possible East Asia contingency. Second, as was also discussed above leaders can make a “threat that leaves something to chance.”[56] They can initiate a nuclear crisis. By playing these risky games of nuclear brinkmanship, states can increases the risk of nuclear war in an attempt to force a less resolved adversary to back down. Historical crises have not resulted in nuclear war, but many of them, including the 1962 Cuban Missile Crisis, have come close. And scholars have documented historical incidents when accidents could have led to war.[57] When we think about future nuclear crisis dyads, such as India and Pakistan and Iran and Israel, there are fewer sources of stability that existed during the Cold War, meaning that there is a very real risk that a future Middle East crisis could result in a devastating nuclear exchange.

#### Conventional proliferation causes conventional wars - quantitative testing proves.

David Sobek et. al, March 2012, Assistant Professor at Louisiana State University, Dennis M. Foster, Associate Professor of International Studies and Political Science at the Virginia Military Institute, Samuel B. Robison, B.A., University of Southern Mississippi; M.A., LSU Office, International Studies Quarterly, Vol. 56 Issue 1, “Conventional Wisdom? The Effect of Nuclear Proliferation on Armed Conflict, 1945–2001,” p. 149–62

The possession of nuclear weapons confers many benefits on a state. The path to proliferation, however, is often violent. When a state initiates a nuclear weapons program, it signals its intent to fundamentally alter its bargaining environment. States that once had an advantage will now be disadvantaged. This change in the environment is not instantaneous, but evolves slowly over time. This gives states both opportunities and incentives to resolve underlying grievances, by force if necessary, before a nuclear weapons program is completed. Our cross-national analyses of nuclear weapons program and the onset of militarized conflict confirm this expectation. In particular, the closer a state gets to acquiring nuclear weapons, the greater the risk it will be attacked (especially over territorial issues). Once nuclear weapons are acquired, however, the risk of being attacked dramatically drops, though not below the risk of attack for non-proliferators. Conventional wisdom holds that the possession of nuclear weapons offers states security from a number of international threats. In particular, the possession of nuclear weapons insulates a state from challenges to its most salient concerns (such as territorial integrity). While ultimately beneficial to proliferators, the path to nuclear status is generally neither instantaneous nor undetectable. As such, it behooves states that wish to challenge proliferators to realize their political goals sooner rather than later. Proliferators, on the other hand, have an incentive to delay the resolution of the contentious issue until the deployment of their nuclear weapons. In this article, we use this set of interacting incentives as a point of departure in delineating a theory of the relationship between the nuclear proliferation process and the frequency with which proliferators are targeted in conventional militarized conflicts. Though much previous scholarship has been devoted to this question, we believe that extant views have focused too narrowly on one subset of that relationship: the preemptive employment of conventional capabilities by status quo powers in order to physically disable or destroy proliferators’ nascent nuclear programs. In developing a broader treatment of the strategic interaction between states, we posit that the various stages of deterrent nuclear proliferation are best conceived of as sequential steps in a bargaining process over preexisting disputes that were instrumental in spurring proliferators to consider nuclear options. As such, we contend that the primary rationale for status quo states’ conventional targeting of proliferators should derive not from the desire to physically disrupt nuclear development (which is, at best, a difficult task), but from the desire to reach favorable conclusions to underlying disputes before the deployment of nuclear weapons drastically complicates the issue. The effect of nuclear proliferation on conventional targeting is tested quantitatively by looking at states in four different stages of the proliferation process: no program, exploration, pursuit, and acquisition (Singh and Way 2004). In general, the results of our analyses show that as states move from no program to exploration and then to pursuit, the odds that that they become the target of a militarized interstate dispute (or MID; Jones, Bremer, and Singer 1996) increase rather steadily. Once actual acquisition is achieved, however, the risk of being targeted decreases. These results are most robust when looking at disputes over territory (which arguably represent conflicts over the most salient interest of states) and territorial disputes that lead to at least one fatality.

#### Central question of the nonproliferation regime is disposal of nuclear fuel - not solving will undercut the global nuclear order.

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GROWING CYNICISM about the nonproliferation regime also threatens to undercut the global nuclear order. It is easy to see why non-nuclear-weapons states view the regime as an instrument for the haves to deny the have-nots. At the NPT Review Conference in 2000, the United States and other nuclear weapons states promised to take 13 "practical steps" toward meeting their NPT commitments, but later, at the Review Conference in 2005, John Bolton, then the U.S. ambassador to the UN, declared those 2000 undertakings inoperable and subsequently banned any use of the word "disarmament" from the "outcome document" of the UN's 60th anniversary summit. In preparation for the 2010 Review Conference, which will convene in May, diplomats at the IAEA have been joined by prime ministers and presidents in displaying considerable suspicion about a regime that permits nuclear weapons states to keep their arsenals but prevents others from joining the nuclear club. Those suspicions are reflected in governments' unwillingness to accept additional constraints that would reduce the risks of proliferation, such as by ratifying the enhanced safeguards agreement known as the Additional Protocol or approving an IAEA-managed multinational fuel bank to ensure states access to fuel for nuclear energy plants. At the same time, rising concerns about greenhouse gas emissions have stimulated a growing demand for nuclear energy as a clean-energy alternative. There are currently 50 nuclear energy plants under construction, most of them in China and India, and 130 more might soon be built globally. Concern arises not from the nuclear reactors themselves but from the facilities that produce nuclear fuel and dispose of its waste product. The hardest part of making nuclear weapons is producing fissile material: enriched uranium or plutonium. The same setup of centrifuges that enriches uranium ore to four percent to make fuel for nuclear power plants can enrich uranium to 90 percent for nuclear bombs. A nuclear regime that allows any state with a nuclear energy plant to build and operate its own enrichment facility invites proliferation. The thorny question is how to honor the right of non-nuclear-weapons states, granted by the NPT, to the "benefits of peaceful nuclear technology" without such a consequence.

#### Dealing with waste is inevitable in the squo – using PRISM is the only method of securing fissile material from theft and stopping proliferation.

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The temptation, when a great mistake has been made, is to seek ever more desperate excuses to sustain the mistake, rather than admit the terrible consequences of what you have done. But now, in the UK at least, we have an opportunity to make amends. Our movement can abandon this drivel with a clear conscience, for the technology I am about to describe ticks all the green boxes: reduce, reuse, recycle. Let me begin with the context. Like other countries suffering from the idiotic short-termism of the early nuclear power industry, the UK faces a massive bill for the storage and disposal of radioactive waste. The same goes for the waste produced by nuclear weapons manufacturing. But is this really waste, or could we see it another way? In his book Prescription for the Planet, the environmentalist Tom Blees explains the remarkable potential of integral fast reactors (IFRs) (11). These are nuclear power stations which can run on what old nuclear plants have left behind. Conventional nuclear power uses just 0.6% of the energy contained in the uranium that fuels it. Integral fast reactors can use almost all the rest. There is already enough nuclear waste on earth to meet the world’s energy needs for several hundred years, with scarcely any carbon emissions. IFRs need be loaded with fissile material just once. From then on they can keep recycling it, extracting ever more of its energy, until a small fraction of the waste remains. Its components have half-lives of tens rather than millions of years. This makes them more dangerous, but much easier to manage in the long term. When the hot waste has been used up, the IFRs can be loaded with depleted uranium (U-238), of which the world has a massive stockpile (12).The material being reprocessed never leaves the site: it remains within a sealed and remotely-operated recycling plant. Anyone trying to remove it would quickly die. By ensuring the fissile products are unusable, the IFR process reduces the risk of weapons proliferation. The plant operates at scarcely more than atmospheric pressure, so it can’t blow its top. Better still, it could melt down only by breaking the laws of physics. If the fuel pins begin to overheat, their expansion stops the fission reaction. If, like the Fukushima plant, an IFR loses its power supply, it simply shuts down, without human agency. Running on waste, with fewer pumps and valves than conventional plants, they are also likely to be a good deal cheaper (13).So there’s just one remaining question: where are they? In 1994 the Democrats in the US Congress, led by John Kerry, making assertions as misleading as the Swift Boat campaign that was later deployed against him(14), shut down the research programme at Argonne National Laboratories that had been running successfully for 30 years. Even Hazel O’Leary, the former fossil fuel lobbyist charged by the Clinton administration with killing it, admitted that “no further testing” is required to prove its feasibility (15).But there’s a better demonstration that it’s good to go: last week GE Hitachi (GEH) told the British government that it could build a fast reactor within five years to use up the waste plutonium at Sellafield, and if it doesn’t work, the UK won’t have to pay (16). A fast reactor has been running in Russia for 30 years (17) and similar plants are now being built in China and India (18, 19). GEH’s proposed PRISM reactor uses the same generating technology as the IFR, though the current proposal doesn’t include the full reprocessing plant. It should. If the government does not accept GEH’s offer, it will, as the energy department revealed on Thursday, handle the waste through mixed oxide processing (mox) instead (20). This will produce a fuel hardly anyone wants, while generating more waste plutonium than we possess already. It will raise the total energy the industry harvests from 0.6% to 0.8% (21). So we environmentalists have a choice. We can’t wish the waste away. Either it is stored and then buried. Or it is turned into mox fuels. Or it is used to power IFRs. The decision is being made at the moment, and we should determine where we stand. I suggest we take the radical step of using science, not superstition, as our guide.

#### Transitioning to PRISMs stops PUREX/UREX development and solves verification difficulties.

John Carlson, 6-4-2009, director general of the Australian Safeguards and Non-proliferation Office, “New Verification Challenges”, research paper has been commissioned by the International Commission on Nuclear Non-proliferation and Disarmament, <http://icnnd.org/Documents/Carlson_Verification_090604.doc>

The verification challenges for the FMCT are expected to be: having to implement verification approaches in old facilities not designed with verification in mind. These are likely to require intensive verification effort - the more of these facilities that can be shut down and decommissioned, the more manageable the verification task will be:- there will be no reason to continue operation of facilities used only for weapons programs (since the NWS have had informal moratoria on fissile production for weapons for many years, presumably no such facilities are operating now);- there should be little if any need to produce HEU (the states with large naval propulsion programs have extensive HEU stocks to draw on);- with advanced spent fuel recycling technologies which will avoid the need to separate plutonium – such as pyro-processing – on the horizon, there should be little or no requirement for new conventional (Purex-based) reprocessing plants, and existing plants could be phased out over time; the verification workload. This highlights the importance of shutting down as many sensitive facilities as possible, and transitioning to new fuel cycle technologies. A state-level approach, discussed below, will also be important for cost-efficient verification; establishing a reliable capability for detecting undeclared fissile material production.

#### Bargaining breaks down with uncertainty and overconfidence from proliferation.

Erik Gartzke, 5-1-2010, Ph.D. in Political Science from the University of Iowa, associate professor of political science at UC San Diego, “Nuclear Proliferation Dynamics and Conventional Conflict,” http://dss.ucsd.edu/~egartzke/papers/nuketime\_05032010.pdf

A third possibility is that uncertainty about nuclear weapons status increases the hazard of militarized disputes. In contrast to the classical approach that emphasizes power relations, contemporary research on the causes of conflict focuses on the role of asymmetric information (Fearon 1995, Wagner 2000). Nations are more likely to fight if they underestimate one another’s respective resolve or capabilities. Bargaining breaks down when competitors cannot identify acceptable offers. Bargaining failures in turn heighten the probability of disputes. If nations are more likely to fight when they are uncertain about an enemy's capabilities, then capability shocks that make nations uncertain about the balance of power will lead to an increase in conflict. Countries with new military advantages may not yet be perceived as possessing significant advantages. Alternately, the proliferating country may itself overestimate the scale of its advantage. Nuclear proliferation is particularly prone to producing this type of uncertainty, given the extreme nature of nuclear capabilities shocks, the secrecy that enshrouds nuclear programs, and the fact that nuclear capabilities are not actually exercised (as opposed to the influence nuclear nations wield). Just as uncertainty peaks with the advent of possible new nuclear status, it decays quickly with the revelation of nuclear capabilities. Certainty about nuclear weapons capability may make countries no more dispute prone than certainty about the lack of nuclear status. War and peace are conditioned on nuclear secrecy or on nuclear uncertainty, not on the proliferation of nuclear weapons per se.8 The effects of uncertainty about nuclear status on whether nations initiate, or are the targets of, conflict are a bit more complicated to unravel. It is possible that uncertainty about nuclear status could lead to bargaining failure, and thus to a greater risk of a contest for either a potential initiator or a target. In the standard bargaining story, a state possesses an advantage about which its counterpart is dubious, either because other states also claim such an advantage, or because it is difficult to ascertain the consequences of the advantage for warfare, should conflict occur. Opponents can also be uncertain about the resolve or preferences of a nation, underestimating not capabilities but the willingness to use them if necessary. In the context of nuclear proliferation, one can imagine that other nations doubt claims of nuclear capabilities, or that they are uncertain about the willingness of a nation to pursue nuclear brinkmanship under certain circumstances, or that the opponent of the new nuclear power discounts delivery systems, command and control, or some other aspect affecting the veracity of threats. A nascent nuclear nation may feel compelled to press advantages that are not yet accepted by other powers. In doing so, the nuclear state risks a greater likelihood of a military contest. While either a potential attacker or a target can be uncertain about capabilities or resolve, it is much more in the nature of a challenger to be dissatisfied with the status quo. Proliferators are preference outliers. The same incentives that lead nations to seek out nuclear capabilities also encourage attempts to use newly acquired leverage to seek to effect change. Once demands are made, underestimation can lead to bargaining failures and warfare.

#### Accidental nuclear war is likely - even rational leaders will lose control of the escalation ladder.

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The proliferation optimist position, while having a distinguished pedigree, has several major problems. Many of these weaknesses have been chronicled in brilliant detail by Scott Sagan and other contemporary proliferation pessimists.[34] Rather than repeat these substantial efforts, I will use this section to offer some original critiques of the recent incarnations of proliferation optimism. First and foremost, proliferation optimists do not appear to understand contemporary deterrence theory. I do not say this lightly in an effort to marginalize or discredit my intellectual opponents. Rather, I make this claim with all due caution and with complete sincerity. A careful review of the contemporary proliferation optimism literature does not reflect an understanding of, or engagement with, the developments in academic deterrence theory in top scholarly journals such as the American Political Science Review and International Organization over the past few decades.[35] While early optimists like Viner and Brodie can be excused for not knowing better, the writings of contemporary proliferation optimists ignore the past fifty years of academic research on nuclear deterrence theory. In the 1940s, Viner, Brodie, and others argued that the advent of Mutually Assured Destruction (MAD) rendered war among major powers obsolete, but nuclear deterrence theory soon advanced beyond that simple understanding.[36] After all, great power political competition does not end with nuclear weapons. And nuclear-armed states still seek to threaten nuclear-armed adversaries. States cannot credibly threaten to launch a suicidal nuclear war, but they still want to coerce their adversaries. This leads to a credibility problem: how can states credibly threaten a nuclear-armed opponent? Since the 1960s academic nuclear deterrence theory has been devoted almost exclusively to answering this question.[37] And, unfortunately for proliferation optimists, the answers do not give us reasons to be optimistic. Thomas Schelling was the first to devise a rational means by which states can threaten nuclear-armed opponents.[38] He argued that leaders cannot credibly threaten to intentionally launch a suicidal nuclear war, but they can make a “threat that leaves something to chance.”[39] They can engage in a process, the nuclear crisis, which increases the risk of nuclear war in an attempt to force a less resolved adversary to back down. As states escalate a nuclear crisis there is an increasing probability that the conflict will spiral out of control and result in an inadvertent or accidental nuclear exchange. As long as the benefit of winning the crisis is greater than the incremental increase in the risk of nuclear war, threats to escalate nuclear crises are inherently credible. In these games of nuclear brinkmanship, the state that is willing to run the greatest risk of nuclear war before back down will win the crisis as long as it does not end in catastrophe. It is for this reason that Thomas Schelling called great power politics in the nuclear era a “competition in risk taking.”[40] This does not mean that states eagerly bid up the risk of nuclear war. Rather, they face gut-wrenching decisions at each stage of the crisis. They can quit the crisis to avoid nuclear war, but only by ceding an important geopolitical issue to an opponent. Or they can the escalate the crisis in an attempt to prevail, but only at the risk of suffering a possible nuclear exchange. Since 1945 there were have been many high stakes nuclear crises (by my count, there have been twenty) in which “rational” states like the United States run a risk of nuclear war and inch very close to the brink of nuclear war.[41] By asking whether states can be deterred or not, therefore, proliferation optimists are asking the wrong question. The right question to ask is: what risk of nuclear war is a specific state willing to run against a particular opponent in a given crisis? Optimists are likely correct when they assert that Iran will not intentionally commit national suicide by launching a bolt-from-the-blue nuclear attack on the United States or Israel. This does not mean that Iran will never use nuclear weapons, however. Indeed, it is almost inconceivable to think that a nuclear-armed Iran would not, at some point, find itself in a crisis with another nuclear-armed power and that it would not be willing to run any risk of nuclear war in order to achieve its objectives. If a nuclear-armed Iran and the United States or Israel have a geopolitical conflict in the future, over say the internal politics of Syria, an Israeli conflict with Iran’s client Hezbollah, the U.S. presence in the Persian Gulf, passage through the Strait of Hormuz, or some other issue, do we believe that Iran would immediately capitulate? Or is it possible that Iran would push back, possibly even brandishing nuclear weapons in an attempt to deter its adversaries? If the latter, there is a real risk that proliferation to Iran could result in nuclear war. An optimist might counter that nuclear weapons will never be used, even in a crisis situation, because states have such a strong incentive, namely national survival, to ensure that nuclear weapons are not used. But, this objection ignores the fact that leaders operate under competing pressures. Leaders in nuclear-armed states also have very strong incentives to convince their adversaries that nuclear weapons could very well be used. Historically we have seen that in crises, leaders purposely do things like put nuclear weapons on high alert and delegate nuclear launch authority to low level commanders, purposely increasing the risk of accidental nuclear war in an attempt to force less-resolved opponents to back down.

#### Controlling the fuel-cycle strengthens tacit bargaining to prohibit war – creates a framework of incentives.

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The nub of the problem is how to preserve the sovereign right of states to enjoy the peaceful benefits of nuclear energy without practising a new discrimination in fuel-cycle capabilities. 33 For even if those states that have not yet developed enrichment and reprocessing facili-ties could be persuaded to rely on external suppliers of fuel, would those that have already crossed the threshold of ‘virtual’ nuclear weapon status be prepared to give up their national control over the fuel-cycle? Just as the NWS argue that the bomb is vital to their security in an uncertain world, so some states view indigenous fuel-cycle capabilities as an insurance against potential adversaries breaking out of the restraints of the NPT, the fear of those nuclear-armed powers outside the treaty and a generalized collapse of the non-proliferation norm. Establishing international controls over the fuel-cycle is a critical challenge in the years ahead. However, it remains to be seen whether those NNWS that are most critical of the failure of the NWS to live up to their promise to disarm can be persuaded to accept constraints on fuel-cycle capabilities in the absence of what the NNWS see as the NWS acting in good faith to honour their obligations under article VI. Even if this were to lead to global zero, there remains the question whether the current NNWS would accept a global nuclear order that froze them into a permanent inferiority vis-à-vis nuclear suppliers who would also have the ultimate leverage of reconstituting their arsenals. George Perkovich and James Acton are right in recognizing that the issue of ‘nuclear equity’ is a major barrier to a future bargain of this kind. They argue that ‘the most acceptable alternative would be to move towards a standard whereby only multinational facilities were allowed everywhere’. 34 But such an ambitious proposal still leaves unanswered the concerns about hedging both inside and outside the treaty. Movement towards a new and far-reaching bargain might seem to require that one of the parties take a leap of trust by accepting substantially greater vulnerability. 35 This is one of the possibilities, but it is unlikely that governments will act in this manner. There is another possibility, which builds on the fact that the signatories of the NPT have already accepted a significant degree of vulner-ability by entering into the treaty in the first place. This alternative rests on one or both parties taking a series of steps that would strengthen the trusting relationship between the NWS and the NNWS. 36 It is at this point that our reinterpretation of the NPT as embodying a set of trusting relationships opens up new ways to think about nuclear non-proliferation policy. If states realize that they have already entered a trusting relationship with other signatories, the actions required to revitalize the grand bargain do not appear as risky as sceptics might suggest. The new bargain could be defended as advan-tageous in terms of pay-offs for both the NWS and the NNWS, exhibiting the intersection of particular interests and the collective interest in non-proliferation. Notwithstanding the pay-offs providing an incentive to enter into the extended bargain (the rationalist approach to trust), a trusting relationship also requires that all parties have good grounds to think that others will do what is right (the binding approach to trust). Establishing the necessary confidence among the signatories that the bargain can be revitalized in the manner set out above would be significantly helped by all NPT states living up to the promises they have made, by a willingness on the part of all signatories to uphold and enforce the norms on which the treaty stands, and by a recognition that trusting relationships are already in place. Historical legacies, feelings of betrayal on all sides—especially on the part of the NNWS— and questioning of others’ motives and integrity create formidable obstacles to strengthening the trusting relationships. What is crucial is that these obstacles do not rule out the possibility of reversing the erosion of trust in the original bargain of the treaty. The fact that the states that have signed up to the treaty argue over each other’s trustworthiness suggests that there is more space for trust than is generally recognized. The steps that are necessary to build trusting relationships both open up and depend on the possibility of new pay-offs as well as mutual bonds. Building trust among the NWS The lack of progress towards nuclear disarmament on the part of the NWS is probably the most contentious sticking point between the signatories of the NPT. The nuclear-armed powers have at best exercised the ‘radical’ rhetoric of admit-ting that they would consider moving towards nuclear disarmament if only the other members of the nuclear club made the first move. Their behaviour is testa-ment to the present limits of their trusting relationship. Which actions and policies could lead to the extension of these limits? Following the end of the Cold War, the context for thinking about nuclear disarmament changed from the bilateral relationship between the United States and the Soviet Union to a more complex web of relationships between the five recognized nuclear powers. Nevertheless, given the enormous size of their nuclear arsenals, the US and Russia still hold the key to strengthening trusting relation-ships among the NWS and ultimately moving towards nuclear disarmament.

#### Counterplan cards and reprocessing turns don’t apply – brain drain, new capacity.

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Many analysts have characterized aboveboard international civil nuclear cooperation—“Atoms for Peace”—as an unmitigated disaster for the cause of nonproliferation. Most of Atoms for Peace’s dwindling band of supporters themselves no longer contest the idea that it has given dozens of developing countries the technical capacity to build nuclear weapons at a time of their 114 Note that despite Tito’s 1974 decision, Gaukhar Mukhatzhanova finds that Solingen’s argument about the impact of liberalizing political coalition interests on regimes’ nuclear intentions generally fits the Yugoslav case pretty well. See Mukhatzhanova, “Nuclear Weapons in the Balkans,” esp. 213–15. choosing. Even such routine practices as the holding of international confer-ences and student exchange programs in the fields of nuclear science and engineering have come under fire. In contrast to these general trends in the literature, this article has offered a more nuanced assessment of the effects of Atoms for Peace. The literature needs to abandon its outdated, oversimplified, techno-centric approach to the supply side of the proliferation equation. When we recognize that “tech-nical” capacity has political foundations, the effects of Atoms for Peace on states’ nuclear weapons capacity appear much different than the literature suggests. In particular, by changing the career opportunities available to the most talented and energetic among the small pool of competent scientific workers in developing country contexts, Atoms for Peace makes their choice for loyalty more complicated, their choice for voice less dangerous, and their choice for exit more feasible. Thus, Atoms for Peace can substantially retard or even reverse the growth of technical capacity to build the bomb, despite the transfer of hardware and know-how that it promotes. The case study of Yugoslavia has substantiated the theorized nonproliferation-promoting effects of Atoms for Peace, even during the pol-icy’s most “na¨ıve” nuclear promotion days of the 1950s and 1960s. As Yu-goslavia represents a hard test for the theory presented here, the findings from this study should be given special heed. We should not be surprised that Atoms for Peace ended up undercutting the Tito regime’s nuclear ambi-tions through such mechanisms as brain drain, since similar findings abound in the broader literature on international technology transfer, with which the proliferation literature needs to engage deeply. This article is not claiming that Atoms for Peace was a silver bullet for nonproliferation in the case of Yugoslavia. Rather, the claim is that over the long run Atoms for Peace intensified and locked in the Yugoslav nuclear program’s poor organizational performance, and accelerated the program’s ultimate collapse. Some readers might be tempted to conclude that since poor organization and management were the root causes of Yugoslavia’s nuclear woes, therefore the effects of Atoms for Peace were superfluous to the outcome. However, it would be wrong to ignore the Atoms for Peace variable simply because it did not singlehandedly prevent a Yugoslav nuclear bomb from coming into being. Recall that up until now, the literature has generally contended that Atoms for Peace helps states leapfrog over their or-ganizational and resource limitations by handing them ready-made solutions to difficult technical problems. So it would already be a significant finding simply to show that Atoms for Peace, even in its heyday in the 1950s and 1960s, actually did not allow them to leapfrog those limitations. But in fact my finding is that Atoms for Peace greatly compounded those limitations, at least in the case of Yugoslavia. My finding turns standard thinking about this question on its head. This finding is not just interestingly counterintu-itive; it also has important implications for United States and international nonproliferation policy. Typical nonproliferation measures, such as export controls and technical safeguards, can hope to achieve little more than to re-strain nuclear programs from moving forward; but I have shown that Atoms for Peace, especially by stimulating the brain drain, ultimately caused the Yu-goslav nuclear program to stumble backward, and made it next to impossible for Belgrade to turn things around. I should also underscore that this article is not claiming that Yugoslavia’s experience with Atoms for Peace necessarily generalizes to every developing country. Some developing countries have been able to leverage civil nuclear cooperation to achieve nuclear weapons more quickly than they otherwise could have. India is often mentioned as a prime example of the danger that Atoms for Peace will unwittingly provide atoms for war. But this article’s focus on Yugoslavia represents a necessary corrective to the literature’s typ-ical focus on proliferation headline-makers like India. Moreover, there are good theoretical reasons to think that the Yugoslav nuclear experience with Atoms for Peace may have been much more typical for developing countries than the Indian experience. First, as noted earlier in the article, the brain drain literature has singled out India as one of the handful of developing countries where the size and quality of the science and technology com-munity are enough to allow it to absorb the hit of a substantial brain drain and yet still benefit through such compensating mechanisms as brain circu-lation, brain diaspora, and brain replacement. 121 Second, the literature on state capacity suggests that the bureaucratic “steel frame” inherited from the British colonial Indian Civil Service, though surely not problem-free, places India far above most other developing countries in terms of its level of state institutionalization. 122 Reflecting these general bureaucratic strengths of the Indian state, the Indian nuclear program was—despite some hiccups—quite well-organized and managed, and this substantially reduced the potential for India’s participation in Atoms for Peace to cause it serious damage. 123 In short, India appears deductively to be a much more exceptional case in the developing world than Yugoslavia, although more in-depth case studies will be necessary before we can say for sure if Yugoslavia’s experience with Atoms for Peace was truly typical or not. 124 121 An anonymous reviewer of this article suggested that we should consider whether, contrary to the general presumption of the proliferation literature, proliferant states often pare back their international civil nuclear cooperation efforts in order to avoid creating complications for their nuclear weapons Proliferation Implications of Civil Nuclear Cooperation 103 It might be that even if Yugoslavia’s experience was typical for its time period, a reenergized Atoms for Peace policy would not have the same nonproliferation-promoting consequences in today’s changed circumstances. But it is also possible to argue that an expanded commitment to overt interna-tional civil nuclear cooperation would have even stronger nonproliferation-promoting consequences in today’s world. After all, the brain drain from the developing world (and post-Communist states) continues to be a major social fact in the contemporary international system. Although the United States demand for the services of developing-world scientists and engineers was already quite high during the 1950s and 1960s, it has become absolutely voracious in recent years. Between 1978 and 2008, the number of U.S. PhD recipients holding temporary visas jumped from 3,475 (11 percent of the total number of doctorates granted by American universities) to 15,246 (31 percent of the total). In the physical sciences, the increase was from 653 (16 percent) to 3,678 (45 percent). In engineering, the increase was from 781 (32 percent) to 4,486 (57 percent). Of these newly minted temporary visa-holding PhDs, in 2008 73.5 percent reported the intention to remain in the United States; this number was generally much higher among those PhDs who had come from developing and post-Communist countries. Meanwhile, the out-migration of the highly skilled is having dramatic consequences on the resource base of sending countries: for instance, 41 percent of all tertiary-educated Caribbeans have emigrated to developed countries; for West Africa the figure is 27 percent; and for East Africa it is 18.4 percent. 125 This mas-sive brain drain is nothing to celebrate; it has caused major social ills in the developing world. But as an empirical matter brain drain is correlated with reduced technological potential, and when it comes to the narrow question of nuclear weapons development, reducing developing countries’ techno-logical potential is not necessarily a bad thing. One could try to turn this argument around and contend that since the brain drain has become so massive, state policies can do little to encourage or discourage it anymore. But in fact the brain drain still depends crucially on facilitative state policies, especially those of the United States and other receiving countries. 126 In the nuclear area in particular, there is no guarantee that those facilitative policies will continue. As noted at the outset of this article, nonproliferation concerns have led the United States to reduce sub-stantially the scope of its international civil nuclear cooperation programs over the past decades, and some nonproliferation advocates want to abolish them altogether.

#### GNEP/IFNEC is faltering - without U.S. leadership in advanced reprocessing technologies - proliferation from the collapsing IFNEC framework will be rampant.

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The International Framework for Nuclear Energy Cooperation (IFNEC), formerly the Global Nuclear Energy Partnership (GNEP), aims to accelerate the development and deployment of advanced nuclear fuel cycle technologies while providing greater disincentives to the proliferation of nuclear weapons. GNEP was initiated by the USA early in 2006, but picked up on concerns and proposals from the International Atomic Energy Agency (IAEA) and Russia. The vision was for a global network of nuclear fuel cycle facilities all under IAEA control or at least supervision. Domestically in the USA, the Global Nuclear Energy Partnership (GNEP) was based on the Advanced Fuel Cycle Initiative (AFCI), and while GNEP faltered with the advent of the Barack Obama administration in Washington from 2008, the AFCI is being funded at higher levels than before for R&D "on proliferation-resistant fuel cycles and waste reduction strategies." Two significant new elements in the strategy are new reprocessing technologies which separate all transuranic elements together (and not plutonium on its own), and advanced burner (fast) reactors to consume the result of this while generating power. GNEP was set up as both a research and technology development initiative and an international policy initiative. It addresses the questions of how to use sensitive technologies responsibly in a way that protects global security, and also how to manage and recycle wastes more effectively and securely. The USA had a policy in place since 1977 which ruled out reprocessing used fuel, on non-proliferation grounds. Under GNEP, reprocessing is to be a means of avoiding proliferation, as well as addressing problems concerning high-level wastes. Accordingly, the US Department of Energy set out to develop advanced fuel cycle technologies on a commercial scale. As more countries consider nuclear power, it is important that they develop the infrastructure capabilities necessary for such an undertaking. As with GNEP, IFNEC partners are working with the IAEA to provide guidance for assessing countries' infrastructure needs and for helping to meet those needs. For countries that have no existing nuclear power infrastructure, IFNEC partners can share knowledge and experience to enable developing countries to make informed policy decisions on whether, when, and how to pursue nuclear power without any need to establish sensitive fuel cycle facilities themselves. With the USA taking a lower profile in GNEP from 2009, the partners are focused on collaboration to make nuclear energy more widely accessible in accordance with safety, security and non-proliferation objectives, as an effective measure to counter global warming, and to improve global energy security. A change of name to International Framework for Nuclear Energy Cooperation was adopted in June 2010, along with a new draft vision statement, which read: "The Framework provides a forum for cooperation among participating states to explore mutually beneficial approaches to ensure the use of nuclear energy for peaceful purposes proceeds in a manner that is efficient, safe, secure, and supports non-proliferation and safeguards." By some accounts, this envisages "cradle to grave" fuel management as central, along with assurance of fuel supply. IFNEC agenda Broadly, IFNEC's mission is the global expansion of nuclear power in a safe and secure manner. A major rationale is reducing the threat of proliferation of nuclear materials and the spread of sensitive nuclear technology for non-peaceful purposes. With greater use of nuclear energy worldwide the possibility of the spread of nuclear material and technology for the development of weapons of mass destruction must be countered to avoid increasing the present threat to global security. A second issue addressed by IFNEC is the efficiency of the current nuclear fuel cycle. The USA, the largest producer of nuclear power, has employed a 'once through' fuel cycle. This practice only uses a part of the potential energy in the fuel, while effectively wasting substantial amounts of useable energy that could be tapped through recycling. The remaining fissionable material can be used to create additional power, rather than treating it as waste requiring long-term storage. Others, notably Europe and Japan, recover the residual uranium and plutonium from the used fuel to recycle at least the plutonium in light water reactors. However, no-one has yet employed a comprehensive technology that includes full actinidea recycle. In the USA, this question is pressing since significant amounts of used nuclear fuel are stored in different locations around the country awaiting shipment to a planned geological repository which was to be at Yucca Mountain in Nevada. This project is delayed, and in any case will fill very rapidly if it is used simply for used fuel rather than the separated wastes after reprocessing it. IFNEC also aims to address cost issues associated with the development and expansion of nuclear power in developing countries. Nuclear programs require a high degree of technical and industrial expertise. This is a serious obstacle for emerging countries attempting to develop nuclear power, although efforts are underway to increase the number of indigenously-trained nuclear experts through a variety of education and training initiatives. Internationally, the countries identified by the US Department of Energy (DOE) as likely participants at both enrichment and recycling ends are the USA, UK, France, Russia and Japan. The USA and Japan agreed to develop a nuclear energy cooperation plan centered on GNEP and the construction of new nuclear power plants. (Japan also intended to participate in the DOE's FutureGen clean coal project, which was abandoned but may possibly be revived.) Several bilateral agreements centered on GNEP/IFNEC have been developed. IFNEC parties and rationale At the first ministerial meeting in May 2007, the USA, China, France, Japan and Russia became formally the founding members of GNEP. Four of the five are nuclear weapons states and have developed full fuel cycle facilities arising from that; the non-nuclear weapons state, Japan, has developed similar facilities to support its extensive nuclear power program. To date, 31 nationsb are participants in IFNEC. Most of these signed the GNEP Statement of Principles1, which established broad guidelines for participation and incorporates seven objectives that touch on each element of GNEP. Under GNEP, so-called 'fuel cycle nations' would provide assured supplies of enriched nuclear fuel to client nations, which would generate electricity before returning the used fuel. The used fuel would then undergo advanced reprocessing so that the uranium and plutonium it contained, plus long-lived minor actinides, could be recycled in advanced nuclear power reactors. Waste volumes and radiological longevity would be greatly reduced by this process, and the wastes would end up either in the fuel cycle or user countries. Nuclear materials would never be outside the strictest controls, overseen by the IAEA. Two sensitive processes in particular would not need to be employed in most countries: enrichment and reprocessing. The limitation on these, by commercial dissuasion rather than outright prohibition, is at the heart of GNEP strategy. A corollary of this dissuasion is that GNEP/IFNEC member nations would be assured of reliable and economic fuel supply under some IAEA arrangement yet to be specified. GNEP/IFNEC work plan The GNEP members set up two principal working groups: The reliable nuclear fuel services working group (RNFS WG) is addressing nuclear fuel leasing and other considerations around comprehensive nuclear fuel supply goals, and includes evaluation of back-end fuel cycle options. The nuclear infrastructure development working group (ID WG) is addressing human resource development, radioactive waste management, small modular reactors, financing options, engagement with specialist organizations and identifying infrastructure requirements for an international nuclear fuel services framework enabling nuclear power deployment in many countries. An early priority was seen to be the development of new reprocessing technologies to enable recycling of most of the used fuel. One of the concerns when reprocessing used nuclear fuel is ensuring that separated fissile material is not used to create a weapon. One chemical reprocessing technology – PUREX – has been employed for over half a century, having been developed in wartime for military use (see page on Processing of Used Nuclear Fuel). This has resulted in the accumulation of 240 tonnes of separated reactor-grade plutonium around the world (though some has been used in the fabrication of mixed oxide fuel). While this is not suitable for weapons use, it is still regarded as a proliferation concern. New reprocessing technologies are designed to combine the plutonium with some uranium and possibly with minor actinides (neptunium, americium and curium), rendering it impractical to use the plutonium in the manufacture of weapons. GNEP/IFNEC creates a framework where states that currently employ reprocessing technologies can collaborate to design and deploy advanced separations and fuel fabrication techniques that do not result in the accumulation of separated pure plutonium. Several developments of PUREX which fit the GNEP/IFNEC concept are being trialled: NUEX separates uranium and then all transuranics (including plutonium) together, with fission products separately (USA). UREX+ separates uranium and then either all transuranics together or simply neptunium with the plutonium, with fission products separately (USA). COEX separates uranium and plutonium (and possibly neptunium) together as well as a pure uranium stream, leaving other minor actinides with the fission products. A variation of this separates americium and curium from the fission products (France). GANEX separates uranium and plutonium as in COEX, then separates the minor actinides plus some lanthanides from the short-lived fission products (France). The central feature of all these variants is to keep the plutonium either with some uranium or with other transuranics which can be destroyed by burning in a fast neutron reactor – the plutonium being the main fuel constituent. Trials of some fuels arising from UREX+ reprocessing in USA are being undertaken in the French Phenix fast reactor. An associated need is to develop the required fuel fabrication plant. That for plutonium with only some uranium and neptunium is relatively straightforward and similar to today's MOX fuel fabrication plants. A plant for fuel including americium and curium would be more complex (due to americium being volatile and curium a neutron emitter). The second main technological development originally envisaged under GNEP is the advanced recycling reactor – basically a fast reactor capable of burning minor actinides. Thus used fuel from light water reactors would be transported to a recycling centre, where it would be reprocessed and the transuranic product (including plutonium) transferred to a fast reactor on site. This reactor, which would destroy the actinides, would have a power capacity of perhaps 1000 MWe. The areas of development for fast reactor technology centre on the need for fast reactors to be cost competitive with current light water reactors. Countries such as France, Russia and Japan have experience in the design and operation of fast reactors and the USA is working with them to accelerate the development of advanced fast reactors that are cost competitive, incorporate advanced safeguards features, and are efficient and reliable. The advent of such fast reactors would mean that reprocessing technology could and should step from the aqueous processes derived from PUREX described above to electrometallurgical processes in a molten salt bath. Separating the actinides then is by electrodeposition on a cathode, without chemical separation of heavy elements as occurs in the Purex and related processes. This cathode product can then be used in a fast reactor, since it is not sensitive to small amounts of impurities. GE Hitachi Nuclear Energy (GEH) is developing this 'Advanced Recycling Center' concept which combines electrometallurgical separation and burning the final product in one or more of its PRISM fast reactors on the same site.2 The separation process would remove uranium, which is recycled to light water reactors; then fission products, which are waste; and finally the actinides including plutonium. With respect to the ultimate disposition of nuclear waste from recycling, three options exist conceptually: User responsibility. The radioactive wastes from the nuclear fuel recycling centre could be considered as processed waste belonging to the user nation that sent its used nuclear fuel to the recycling centre. These wastes might then be shipped back to that user nation for final disposal. Supplier responsibility. The nation hosting the recycling centre might retain the waste or, if a different supplier nation had manufactured the original fuel, all wastes arising from the original fuel could be considered the responsibility of that fuel supplier nation. Third-party responsibility. A disposal facility might be sited in a country that is, in particular cases, neither the supplier nor the user, but is using its technological capability and geological suitability to manage the safe delivery of a commercially and environmentally valuable service. The IFNEC program is considering the ownership and final disposal of waste, but this discussion has not yet reached beyond the preliminary stages. The second and third conceptual options for waste disposal would require one or more international radioactive waste final disposal facilities (see page on International Nuclear Waste Disposal Concepts), and serious discussion of those options will begin only when nations enter into real consideration of the sensitive issue of the hosting of such facilities. In 2012 the RNFS WG is working on a paper entitled ‘Comprehensive Fuel Services: Strategies for the Back End of the Fuel Cycle’ to pursue agreement on the basis for international cooperation on repositories and reprocessing for these activities to be commercialised. Finally, IFNEC is concerned to foster the development of 'grid-appropriate reactors', i.e. smaller units (perhaps 50-350 MWe) for electricity grids of up to 3 GWe. These should incorporate advanced features including safety, simplicity of operation, long-life fuel loads, intrinsic proliferation-resistance and security3. In January 2007, the US Department of Energy (DOE) announced a new strategic plan for GNEP initiatives, including preparation of an environmental impact statement. It would assess three facilities: a fuel recycling centre including reprocessing and fuel fabrication plants; a fast reactor to burn the actinide-based fuel and transmute transuranic elements; and an advanced fuel cycle research facility. The DOE envisaged the first two being industry-led initiatives. In October 2007, the DOE awarded $16 million to four industry consortia for GNEP-related studies. The largest share of this, $5.6 million, went to the International Nuclear Recycling Alliance (INRA) led by Areva and including Mitsubishi Heavy Industries (MHI), Japan Nuclear Fuel Ltd (JNFL), Battelle, BWX Technologies and Washington Group International. INRA was contracted to provide three major studies: technology development roadmaps analyzing the technology needed to achieve GNEP goals; business plans for the development and commercialization of the advanced GNEP technologies and facilities; and conceptual design studies for the fuel recycling centre and advanced recycling reactor. Areva and JNFL are focused on the Consolidated Fuel Treatment Center, a reprocessing plant (which will not separate pure plutonium), and MHI on the Advanced Recycling Reactor, a fast reactor which will burn actinides with uranium and plutonium. These are the two main technological innovations involved with GNEP. In this connection MHI has also set up Mitsubishi FBR Systems (MFBR). INRA appears to have materialized out of a September 2007 agreement between Areva and JNFL to collaborate on reprocessing. Its contract with the DOE was extended in April 2008. A significant setback for the US leadership of GNEP was related to funding by Congress. For FY 2007 the program – including some specifically US aspects – had $167 million, and for FY 2008 Congress cut it back to $120 million, severely constraining the fuel cycle developments. For FY 2009, GNEP did not receive any funding although $120 million was allocated to the Advanced Fuel Cycle Initiative (AFCI), which funds research into reprocessing technologies. The funding for AFCI was only about 40% of the amount requested by the administration. Thus in the USA, GNEP has been largely reduced to an R&D program on advanced fuel cycle technologies. In June 2009, the DOE cancelled the programmatic environmental impact statement for GNEP "because it is no longer pursuing domestic commercial reprocessing, which was the primary focus of the prior Administration's domestic GNEP program."4 Outcomes of IFNEC Under any scenario, the USA and others will require waste repositories; however, recycling used fuel will greatly reduce the amount of waste destined for disposal. For the planned US repository at Yucca Mountain in Nevada, the reprocessing-recycling approach with burning of actinides and perhaps also some long-lived fission products would mean that the effective capacity of such a repository would be increased by a factor of 50 or more. This is due to decreased radiotoxicity and heat loads, as well as reducing greatly the ultimate volume of waste requiring disposal. IFNEC envisages the development of comprehensive fuel services, including such options as fuel leasing, to begin addressing the challenges of reliable fuel supply while maximizing non-proliferation benefits. The establishment of comprehensive and reliable fuel services, including used fuel disposition options, will create a more practical approach to nuclear power for nations seeking its benefits without the need to establish indigenous fuel cycle facilities. It is through enabling such a comprehensive framework that IFNEC will possibly make its primary contribution to reducing proliferation risk.

#### The plan would cause quick U.S.-Russia PRISM commercialization and fissile material oversight.

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While the scientists and engineers were perfecting the many revolutionary features of the IFR at the EBR-II site in the Eighties and early Nineties, a consortium of major American firms collaborated with them to design a commercial-scale fast reactor based on that research. General Electric led that group, which included companies like Bechtel, Raytheon and Westinghouse, among others. The result was a modular reactor design intended for mass production in factories, called the PRISM (Power Reactor Innovative Small Module). A later iteration, the S-PRISM, would be slightly larger at about 300 MWe, while still retaining the features of the somewhat smaller PRISM. For purposes of simplicity I will refer hereinafter to the S-PRISM as simply the PRISM. After the closure of the IFR project, GE continued to refine the PRISM design and is in a position to pursue the building of these advanced reactors as soon as the necessary political will can be found. Unfortunately for those who would like to see America’s fast reactor be built in America, nuclear politics in the USA is nearly as dysfunctional as it is in Germany. The incident at Fukushima has only made matters worse. The suggestion in this report that fast reactors are thirty years away is far from accurate. GE-Hitachi plans to submit the PRISM design to the Nuclear Regulatory Commission (NRC) next year for certification. But that time-consuming process, while certainly not taking thirty years, may well be in process even as the first PRISM is built in another country. This is far from unprecedented. In the early Nineties, GE submitted its Advanced Boiling Water Reactor (ABWR) design to the NRC for certification. GE then approached Toshiba and Hitachi and arranged for each of those companies to build one in Japan. Those two companies proceeded to get the design approved by their own NRC counterpart, built the first two ABWRs in just 36 and 39 months, fueled and tested them, then operated them for a year before the NRC in the US finally certified the design. International partners On March 24th an event was held at the Russian embassy in Washington, D.C., attended by a small number of members of the nuclear industry and its regulatory agencies, both foreign and domestic, as well as representatives of NGOs concerned with nuclear issues. Sergei Kirienko, the director-general of Rosatom, Russia’s nuclear power agency, was joined by Dan Poneman, the deputy secretary of the U.S. Dept. of Energy. This was shortly after the Fukushima earthquake and tsunami, at a time when the nuclear power reactors at Fukushima Daiichi were still in a very uncertain condition. Mr. Kirienko and Mr. Poneman first spoke about the ways in which the USA and Russia have been cooperating in tightening control over fissile material around the world. Then Mr. Kirienko addressed what was on the minds of all of us: the situation in Japan and what that portends for nuclear power deployment in the USA and around the world. He rightly pointed out that the Chernobyl accident almost exactly 25 years ago, and the Fukushima problems now, clearly demonstrate that nuclear power transcends national boundaries, for any major accident can quickly become an international problem. For this reason Kirienko proposed that an international body be organized that would oversee nuclear power development around the world, not just in terms of monitoring fissile material for purposes of preventing proliferation (much as the IAEA does today), but to bring international expertise and oversight to bear on the construction and operation of nuclear power plants as these systems begin to be built in ever more countries. Kirienko also pointed out that the power plants at risk in Japan were old reactor designs. He said that this accident demonstrates the need to move nuclear power into the modern age. For this reason, he said, Russia is committed to the rapid development and deployment of metal-fueled fast neutron reactor systems. His ensuing remarks specifically reiterated not only a fast reactor program (where he might have been expected to speak about Gen III or III+ light water reactor systems), but the development of metal fuel for these systems. This is precisely the technology that was developed at Argonne National Laboratory with the Integral Fast Reactor (IFR) program, but then prematurely terminated in 1994 in its final stages. For the past two years I’ve been working with Dr. Evgeny Velikhov (director of Russia’s Kurchatov Institute and probably Russia’s leading scientist/political advisor) to develop a partnership between the USA and Russia to build metal-fueled fast reactors; or to be more precise, to facilitate a cooperative effort between GE-Hitachi and Rosatom to build the first PRISM reactor in Russia as soon as possible. During those two years there have been several meetings in Washington to put the pieces in place for such a bilateral agreement. The Obama administration, at several levels, seems to be willingly participating in and even encouraging this effort. Dr Evgeny Velikhov, SCGI member Dr. Velikhov and I (and other members of the Science Council for Global Initiatives) have also been discussing the idea of including nuclear engineers from other countries in this project, countries which have expressed a desire to obtain or develop this technology, some of which have active R&D programs underway (India, South Korea, China). Japan was very interested in this technology during the years of the IFR project, and although their fast reactor development is currently focused on their oxide-fueled Monju reactor there is little doubt that they would jump at the chance to participate in this project. Dr. Velikhov has long been an advocate of international cooperation in advanced nuclear power research, having launched the ITER project about a quarter-century ago. He fully comprehends the impact that international standardization and deployment of IFR-type reactors would have on the well-being of humanity at large. Yet if Russia and the USA were to embark upon a project to build the first PRISM reactor(s) in Russia, one might presume that the Russians would prefer to make it a bilateral project that would put them at the cutting edge of this technology and open up golden opportunities to develop an industry to export it. It was thus somewhat surprising when Mr. Kirienko, in response to a question from one of the attendees, said that Russia would be open to inviting Japan, South Korea and India to participate in the project. One might well question whether his failure to include China in this statement was merely an oversight or whether that nation’s notorious reputation for economic competition often based on reverse-engineering new technologies was the reason. I took the opportunity, in the short Q&A session, to point out to Mr. Poneman that the Science Council for Global Initiatives includes not just Dr. Velikhov but most of the main players in the development of the IFR, and that our organization would be happy to act as a coordinating body to assure that our Russian friends will have the benefit of our most experienced scientists in the pursuit of this project. Mr. Poneman expressed his gratitude for this information and assured the audience that the USA would certainly want to make sure that our Russian colleagues had access to our best and brightest specialists in this field. Enter the United Kingdom Sergei Kirienko was very clear in his emphasis on rapid construction and deployment of fast reactors. If the United States moves ahead with supporting a GE-Rosatom partnership, the first PRISM reactor could well be built within the space of the next five years. The estimated cost of the project will be in the range of three to four billion dollars (USD), since it will be the first of its kind. The more international partners share in this project, the less will be the cost for each, of course. And future copies of the PRISM have been estimated by GE-Hitachi to cost in the range of $1,700/kW. Work is under way on gram samples of civil plutonium According to this consultation document, the UK is looking at spending £5-6 billion or more in dealing with its plutonium. Yet if the plutonium were to simply be secured as it currently is for a short time longer and the UK involved itself in the USA/Russia project, the cost would be a small fraction of that amount, and when the project is completed the UK will have the technology in hand to begin mass-production of PRISM reactors. The plutonium stocks of the UK could be converted into metal fuel using the pyroprocessing techniques developed by the IFR project (and which, as noted above, are ready to be utilized by South Korea). The Science Council for Global Initiatives is currently working on arranging for the building of the first commercial-scale facility in the USA for conversion of spent LWR fuel into metal fuel for fast reactors. By the time the first PRISM is finished in Russia, that project will also likely be complete. What this would mean for the UK would be that its stores of plutonium would become the fast reactor fuel envisioned by earlier policymakers. After a couple years in the reactor the spent fuel would be ready for recycling via pyroprocessing, then either stored for future use or used to start up even more PRISM reactors. In this way not only would the plutonium be used up but the UK would painlessly transition to fast reactors, obviating any need for future mining or enrichment of uranium for centuries, since once the plutonium is used up the current inventories of depleted uranium could be used as fuel. Conclusion Far from being decades away, a fully-developed fast reactor design is ready to be built. While I’m quite certain that GE-Hitachi would be happy to sell a PRISM to the UK, the cost and risk could be reduced to an absolute minimum by the happy expedient of joining in the international project with the USA, Russia, and whichever other nations are ultimately involved. The Science Council for Global Initiatives will continue to play a role in this project and would be happy to engage the UK government in initial discussions to further explore this possibility. There is little doubt that Russia will move forward with fast reactor construction and deployment in the very near future, even if the PRISM project runs into an unforeseen roadblock. It would be in the best interests of all of us to cooperate in this effort. Not only will the deployment of a standardized modular fast reactor design facilitate the disposition of plutonium that is currently the driving force for the UK, but it would enable every nation on the planet to avail itself of virtually unlimited clean energy. Such an international cooperative effort would also provide the rationale for the sort of multinational nuclear power oversight agency envisioned by Mr. Kirienko and others who are concerned not only about providing abundant energy but also in maintaining control over fissile materials.

#### Russian nuclear security is a joke spent nuclear fuel is highly vulnerable to terrorist theft – cited means and motivation.

Stephen Menesick, Summer 2011, Political Science and Peace, War and Defense, public policy analysis, Unviersity of Chapel Hill, Global Security Studies, Vol. 2 Issue 3, “ Preventing the Unthinkable: An Overview of Threats, Risks, and US Policy Response to Nuclear Terrorism,” p. 5-6, <http://globalsecuritystudies.com/Menesick%20Nuclear%20Final.pdf>

The outlook in Russia is bleaker. After the Cold War, many Russian nuclear weapons were extremely vulnerable—left nearly unsecured across the country. Since then, the Russian government has made a considerable effort to strengthen security and upgrade technology that guards nuclear weapons and material (Bunn, 2006). However, significant risks still remain. Because of the sheer quantity of weapons in Russia, and the difficulty of managing such a large number of weapons, external risks of outright theft are always a concern. Reports by Russian officials have confirmed that terrorists have conducted intelligence gathering operations on Russian stockpiles, and to date, it is the only country where documentation of terrorist surveillance exists (Bunn 2010, 35). Equipping all sites with state of the art security measures has been a difficult challenge. The Russian government, and consequently the security contractors who are responsible for the upkeep of these facilities, suffers from a lack of financial resources (Joyner & Parkhouse 2009, 215). Additionally, significant internal threats are present. Because the government employs independent security companies to coordinate much of management of nuclear materials, there are two channels for insiders to aid terrorist groups—high level government officials and low level technical personnel. Both groups have incentive to divulge information at the right price, and Russia has a political environment that has been rife with corruption for decades (Bunn 2010, 32-33 and Joyner & Parkhouse 2009, 216). Finally, there is the security risk of Highly Enriched Uranium-fueled reactors (HEU’s). Because of its chemical composition and refinement, HEU can be used easily to make crude nuclear weapons even by non-experts (Norwegian Project Secretariat). Because of the ease with which a weapon can be made out of HEU, it is easy to see why terrorist acquisition is a direct security risk. As of 2009, about half of the 200 remaining reactors were still using HEU fuel, and do not have capability to be converted to lower enriched uranium (LEU) (World Nuclear Association 2011). Most of these are in Russia, where the government has invested little in research to convert their own reactors to LEU power or other alternatives (World Nuclear Association 2011). Further, and most alarming, is that the security at many of these HEU sites is inadequate to prevent theft of HEU, making research reactors a prime target for terrorists seeking to obtain nuclear material (Bunn, 2010, 45). If a terrorist group only acquires nuclear material, and not a functional weapon, they will have to successfully create a weapon that they can detonate. Unfortunately, this is an achievable end that can be done with little resources or expertise. As discussed above, Highly Enriched Uranium is pure enough that it can be made into a devastating weapon relatively easily, and it is also the most likely nuclear material that terrorists would get their hands on. The perception of modern nuclear weapons may be that they are highly technical instruments of warfare backed by complex science. While this may be true, a “crude” nuclear weapon, one that takes little skill to create, would still be incredibly deadly—capable of destroying the downtown of a major city (Bunn, 2010, 16). The process of building a weapon of this type is not entirely simple, and anyone who wanted to construct such a device would need a technical team with at least some experience. However, in comparison to the nuclear weapons manufactured today, a crude bomb would be a more feasible project, as it would not have to comply with rigorous military and safety specifications. Thus, it is plausible to see that this kind of power is not out of reach for dedicated terrorist groups, should they acquire nuclear material (Ferguson & Potter 2003, 116). Having acquired nuclear material and created a weapon, the final obstacle a terrorist group would need to pass would be delivery and detonation in the target location. Likely, this would involve them smuggling a bomb or device into the United States, and then into a major city, undetected. Nuclear material is quite difficult to track, especially the small amounts that would be needed for a crude weapon (Bunn 2010, 18). Journalists have repeatedly demonstrated the ease with which radioactive materials can be transported and shielded from detection while traveling (Ferguson & Potter 2003, 141). Even with the most advanced technology, HEU is among the most difficult kind of radiological material to detect (Montgomery 2009, 79). Also, terrorists could use existing port and transport systems in place, as they are relatively unsecure. Customs and Border Patrol inspects only around 6% of cargo containers entering the US (Medalia 2005). Even with increased security measures and Port Authority reorganization in 2003, there are still plausible scenarios for terrorist groups sneaking radioactive materials into the US via boat undetected (Ferguson & Potter 2003, 300). Furthermore, terrorists could avoid this obstacle entirely by taking materials that were already inside the US. Once inside the US, delivery and detonation to target site would also not be insurmountable. As Matthew Bunn and E. P. Maslin write: The length of national borders, the diversity of means of transport, the vast scale of legitimate traffic across borders, and the ease of shielding the radiation from plutonium or especially from HEU all operate in favor of the terrorists. Building the overall system of legal infrastructure, intelligence, law enforcement, border and customs forces, and radiation detectors needed to find and recover stolen nuclear weapons or materials, or to interdict these as they crossnational borders, is an extraordinarily difficult challenge. (Bun & Maslin 2010) In order for a terrorist group to be “successful” in carrying out a nuclear attack, many elements must come together. There is no doubt that the end result of a nuclear terrorist attack would be terrible, so even with a low probability of attack, the high impact possibility means steps should still be taken to prevent it. In each link of the chain of attack, there are security measures that have been put in place, and continue to be upgraded. However, as discussed above, there are still vulnerabilities in each step of the process that, if they all were orchestrated together, terrorists could exploit to pull off an attack with a nuclear weapon. The most critical of these links is acquisition of a bomb or nuclear material, because it is the only one that truly prevents an attack from occurring. Once a terrorist group has nuclear material, they can find people willing to make it into a usable weapon if they cannot themselves.

#### Causes retaliation and global nuclear war – only the plan solves.

Patrick F. Speice, Jr., Feburary 2006, is an associate in Gibson, Dunn & Crutcher's Washington, D.C. office, works in the firm’s International Trade Regulation and Compliance Department, focusing on export controls, foreign regulations, and economic sanctions, earned his J.D. in 2006 from the Marshall-Wythe School of Law at the College of William & Mary, William and Mary Research Fellowpolitical science, Wake Forest University, authored or co-authored professional articles, includes representation of clients in Foreign Corrupt Practices matters and securities investigations, “Negligence and Nuclear Nonproliferation,” William & Mary Law Review, Lexis Nexis

Accordingly, there is a significant and ever-present risk that terrorists could acquire a nuclear device or fissile material from Russia as a result of the confluence of Russian economic decline and the end of stringent Soviet-era nuclear security measures. 39 Terrorist groups could acquire a nuclear weapon by a number of methods, including "steal[ing] one intact from the stockpile of a country possessing such weapons, or ... [being] sold or given one by [\*1438] such a country, or [buying or stealing] one from another subnational group that had obtained it in one of these ways." 40 Equally threatening, however, is the risk that terrorists will steal or purchase fissile material and construct a nuclear device on their own. Very little material is necessary to construct a highly destructive nuclear weapon. 41 Although nuclear devices are extraordinarily complex, the technical barriers to constructing a workable weapon are not significant. 42 Moreover, the sheer number of methods that could be used to deliver a nuclear device into the United States makes it incredibly likely that terrorists could successfully employ a nuclear weapon once it was built. 43 Accordingly, supply-side controls that are aimed at preventing terrorists from acquiring nuclear material in the first place are the most effective means of countering the risk of nuclear terrorism. 44 Moreover, the end of the Cold War eliminated the rationale for maintaining a large military-industrial complex in Russia, and the nuclear cities were closed. 45 This resulted in at least 35,000 nuclear scientists becoming unemployed in an economy that was collapsing. 46 Although the economy has stabilized somewhat, there [\*1439] are still at least 20,000 former scientists who are unemployed or underpaid and who are too young to retire, 47 raising the chilling prospect that these scientists will be tempted to sell their nuclear knowledge, or steal nuclear material to sell, to states or terrorist organizations with nuclear ambitions. 48 The potential consequences of the unchecked spread of nuclear knowledge and material to terrorist groups that seek to cause mass destruction in the United States are truly horrifying. A terrorist attack with a nuclear weapon would be devastating in terms of immediate human and economic losses. 49 Moreover, there would be immense political pressure in the United States to discover the perpetrators and retaliate with nuclear weapons, massively increasing the number of casualties and potentially triggering a full-scale nuclear conflict. 50 In addition to the threat posed by terrorists, leakage of nuclear knowledge and material from Russia will reduce the barriers that states with nuclear ambitions face and may trigger widespread proliferation of nuclear weapons. 51 This proliferation will increase the risk of nuclear attacks against the United States [\*1440] or its allies by hostile states, 52 as well as increase the likelihood that regional conflicts will draw in the United States and escalate to the use of nuclear weapons. 53

#### By itself terrorism causes extinction.

Owen B. Toon, 4-19-2007, is professor of Atmospheric and Oceanic Sciences and a fellow at the Laboratory for Atmospheric and Space Physics (LASP) at the University of Colorado received his Ph.D. from Cornell University, in cloud physics, atmospheric chemistry and radiative transfer, “Atmospheric effects and societal consequences of regional scale nuclear conﬂicts and acts of individual nuclear terrorism,” Atmosphere Chemistry Physics

To an increasing extent, people are congregating in the world’s great urban centers, creating megacities with popula- tions exceeding 10 million individuals. At the same time, ad- vanced technology has designed nuclear explosives of such small size they can be easily transported in a car, small plane or boat to the heart of a city. We demonstrate here that a sin- gle detonation in the 15 kiloton range can produce urban fa- talities approaching one million in some cases, and casualties exceeding one million. Thousands of small weapons still ex- ist in the arsenals of the U.S. and Russia, and there are at least six other countries with substantial nuclear weapons invento- ries. In all, thirty-three countries control sufficient amounts of highly enriched uranium or plutonium to assemble nuclear explosives. A conflict between any of these countries involv- ing 50-100 weapons with yields of 15kt has the potential to create fatalities rivaling those of the Second World War. Moreover, even a single surface nuclear explosion, or an air burst in rainy conditions, in a city center is likely to cause the entire metropolitan area to be abandoned at least for decades owing to infrastructure damage and radioactive contamina- tion. As the aftermath of hurricane Katrina in Louisiana sug- gests, the economic consequences of even a localized nuclear catastrophe would most likely have severe national and inter- national economic consequences. Striking effects result even from relatively small nuclear attacks because low yield det- onations are most effective against city centers where busi- ness and social activity as well as population are concen- trated. Rogue nations and terrorists would be most likely to strike there. Accordingly, an organized attack on the www.atmos-chem-phys.net/7/1973/2007/ Atmos. Chem. Phys., 7, 1973–2002, 2007 Page 28 2000 O. B. Toon et al.: Consequences of regional scale nuclear conflicts U.S. by a small nuclear state, or terrorists supported by such a state, could generate casualties comparable to those once predicted for a full-scale nuclear “counterforce” exchange in a superpower conflict. Remarkably, the estimated quantities of smoke generated by attacks totaling about one megaton of nuclear explosives could lead to significant global climate perturbations (Robock et al., 2007). While we did not ex- tend our casualty and damage predictions to include poten- tial medical, social or economic impacts following the initial explosions, such analyses have been performed in the past for large-scale nuclear war scenarios (Harwell and Hutchin- son, 1985). Such a study should be carried out as well for the present scenarios and physical outcomes.

### 1AC climate advantage

#### ADVANTAGE:\_\_ climate change

#### Solving electricity is the first step to solve climate change because without nuclear power warming is inevitable.

Barry Brook et. al, 2-21-2009, a leading environmental scientist, holding the Sir Hubert Wilkins Chair of Climate Change at the School of Earth and Environmental Sciences, and is also Director of Climate Science at the University of Adelaide’s Environment Institute, published three books, over 200 refereed scientific papers, is a highly cited researcher, received a number of distinguished awards for his research excellence including the Australian Academy of Science Fenner Medal, is an International Award Committee member for the Global Energy Prize, Australian Research Council Future Fellow, ISI Researcher, Ph.D., Macquarie University in Environmental Engineering, Science Council for Global Initiatives, Edgeworth David Medal Royal Society of NSW, Cosmos Bright Sparks Award, Tom Blees is the author of Prescription for the Planet, the president of the Science Council for Global Initiatives, member of the selection committee for the Global Energy Prize, George S. Stanford is a nuclear reactor physicist, part of the team that developed the Integral Fast Reactor, PhD from Stanford University in Physics, Masters from University of Virginia in Engineering, worked at Argonne National Laboratory, Graham R.L. Cowan, "Boron: A Better Energy Carrier than Hydrogen?" in 2001, published "How Fire Can Be Tamed," BraveNewClimate, “Response to an Integral Fast Reactor (IFR) critique,” <http://bravenewclimate.com/2009/02/21/response-to-an-integral-fast-reactor-ifr-critique/>

[TB] Almost 80% of greenhouse gas emissions come from nuclear-capable countries anyway, so even if we just deployed them there we could make tremendous strides, though it would still be wise to create some sort of international oversight organization as I propose in the book. [BWB] This is at best grossly disingenuous (not to mention insulting to call Kirsch stupid). You need to solve the electricity carbon problem to fix the vehicular fuels problem, space heating and embedded energy in building and manufactured goods, and Tom has a solution for MSW [municipal solid waste] also. About half of agricultural emissions can also be solved if you have a zero-carbon energy source. Then you just need to worry about the ruminant methane and carbon from deforestation. But the bottom line is, if you fix electricity, everything else will quicktly start to fall into place. If we don’t stop coal in places like China and India, we’re hosed, irrespective of what we might do in the US and Oz (and even if we could do with without advanced nuclear, which we very likely cannot). I do wonder, what is Jim Green’s plan is for replacing the 484 GW of coal-fired power stations already installed in China, and the further 200 or so plants in the planning or construction pipeline?

#### PRISM is needed to now to deal with climate issues – renewables and other fuels fail.

Barry Brook & Tom Blees, 10-23-2012, a leading environmental scientist, holding the Sir Hubert Wilkins Chair of Climate Change at the School of Earth and Environmental Sciences, and is also Director of Climate Science at the University of Adelaide’s Environment Institute, published three books, over 200 refereed scientific papers, is a highly cited researcher, received a number of distinguished awards for his research excellence including the Australian Academy of Science Fenner Medal, is an International Award Committee member for the Global Energy Prize, Australian Research Council Future Fellow, ISI Researcher, Ph.D., Macquarie University in Environmental Engineering, Science Council for Global Initiatives, Edgeworth David Medal Royal Society of NSW, Cosmos Bright Sparks Award, Tom Blees is the author of Prescription for the Planet, the president of the Science Council for Global Initiatives, member of the selection committee for the Global Energy Prize, BraveNewClimate, “The Case for Near-term Commercial Demonstration of the Integral Fast Reactor,” <http://bravenewclimate.com/2012/10/23/the-case-for-near-term-commercial-demonstration-of-the-integral-fast-reactor/>

There is a pressing need to: (a) displace our heavy dependence on fossil fuels with sustainable, low-carbon alternative energy sources over the coming decades to mitigate the environmental damage of energy production and underpin global energy security [17], and (b) demonstrate a credible and acceptable way to safely deal with used nuclear fuel in order to clear a socially acceptable pathway for nuclear fission to be a major low-carbon energy source for this century. Given the enormous technical, logistical and economic challenges of adding carbon capture and storage to coal and gas power plants, we are faced with the necessity of a nearly complete transformation of the world’s energy systems. Objective analyses of the inherent constraints on wind, solar, and other less-mature renewable energy technologies inevitably show that they will fall short of meeting future low-emissions demands. A ‘go slow, do little’ approach to energy policy is not defensible given the urgency of the problems society must address, and the time required for an orderly transition of energy systems at a global scale. As such, SCGI advocates a near-term deployment of the Integral Fast Reactor. What is needed now is a two-pronged approach, for completion by 2020 or earlier, that involves: (i) demonstration of the pyroprocessing of LWR spent oxide fuel, and (ii) construction of a PRISM fast reactor as a prototype demonstration plant, to establish the basis for licensing and the cost and schedule for subsequent fully commercial IFR plants. Once demonstrated, this commercial IFR will be expected to show very significant advances in nuclear safety, reliability, nuclear fuel sustainability, management of long-term waste, proliferation resistance, and economics. The time has come to capitalize on this exceptional energy technology, with the benefits of this development extending throughout the global energy economy in the 21st century.

#### Nuclear power is the most economic source of base-load power it’s key to solve GHG emissions by displacing pollutants.

Alexander DeVolpi, 2-28-2010, been active in nuclear-arms policy and treaty-verification technology studies for over 25 years, Argonne National Laboratory, Argonne, Illinois (and other national laboratories) involved nearly 40 years of lab, field, and analytical activities in instrumentation, nuclear physics, nuclear engineering, reactor safety, radioisotopes, experiments, verification technology, and arms control, the Defense Nuclear Agency, On-Site Inspection Agency, all the Department of Energy weapons labs, with the Departments of Defense and State, author or coauthor of several books, Ph.D. in physics (and MS in nuclear engineering physics) from Virginia Polytechnic Institute, certificate from the Argonne International Institute of Nuclear Science and Engineering, managing nuclear diagnostics for the Reactor Analysis and Safety Division at Argonne, and becoming technical manager of the arms-control and nonproliferation program, Who’s Who in Frontiers of Science and Technology, American Men and Women of Science, fellow of the American Physical Society, technical consultant in the Federation of American Scientists/Natural Resources Defense Council joint project, ScienceTechnologyHistory, “NUCLEAR EXPERTISE: The Amory Lovins Charade,” <http://sciencetechnologyhistory.wordpress.com/article/nuclear-expertise-the-amory-lovins-1gsyt5k142kc5-20/>

Nuclear power is not only commercially competitive, but extremely safe (no coal miners dying), no air pollution at all, no greenhouse gas emissions (such as carbon-dioxide). Nuclear-plant lifetime is being doubled from 30 to 60 years (which utilities, investors, and ratepayers appreciate). If Lovins had his way 30 years ago, considerably more particulates and gases would have been vented to the local and regional atmosphere from coal-fired plants (aside from the greenhouse gases emitted). Moreover, if Lovins had his way, we would not have conserved the electricity-equivalent in domestic coal, imported and domestic oil, and domestic and imported natural-gas resources and reserves that we have for 30 years. A typical nuclear power plant each year avoids consumption of 3.4 million short tons of coal, or 65.8 billion cubic feet of natural gas, or 14 billion barrels of oil. (The United States has ample uranium resources.) So Lovins was wrong in implying that nuclear had no overriding societal or environmental benefits. Incidentally, it’s no accident that Illinois has the highest concentration of nuclear-power plants in the United States: Argonne National Laboratory can be proud of its half-century nuclear stewardship. (California, by the way, generates more electricity from geothermal, solar, and wind energy sources combined than any other State.) Lovins displayed complex viewgraphs that, he purports, show that nuclear is the costliest of “low-or-non-nuclear resources.” Yet, in the last 30 years, nuclear has displaced half the fossil-fuel combustion in Illinois while still being competitive. Inasmuch as nuclear-power plants emit no byproduct carbon-dioxide to the atmosphere, surely his claim that it is the costliest of low-carbon-emission sources fails the smell test. Most of Lovins’ pricing and cost/benefit comparisons are based on “new delivered electricity” which frames the cost of U.S. domestic nuclear construction in the least favorable light. He declares nuclear power an economic failure. Can someone explain that to my bank account which has benefitted from compounding competitive electric power savings for the past 30 years? His rimy claim certainly fails the ripeness test. On the issue of electrical-grid reliability, Lovins asserts that there is no such thing as a “outage-free” source of electrical power. He must think that nuclear power runs by government fiat. Nuclear is a fixture on the grid because it is more economical to operate as base-load supply, while sources less reliable, intermittent, and more costly (such as wind, solar, and gas) provide supplementary power. During the past 30 years in Illinois, I don’t recall having the electricity supply and cost problems that California has had after it prohibited nuclear-power plants from being built within its borders. By the way, average U.S. nuclear capacity factor was about 92% in 2007. That’s excellent. Lovins pitiful effort to undermine the reliability of nuclear power egregiously fails the smell test.

#### Anthropogenic warming causes extinction – mitigating coal in the electric power industry is key to solve.

Mudathir F. Akorede et. al, June 2012, M.Eng degree at Bayero University Kano in Electrical Engineering, tutelage engineer in the Chad Basin Development Authority’s, lectureship appointment in the Department of Electrical Engineering, University of Ilorin, professional engineer with the Council for Regulation of Engineering in Nigeria (COREN), reviewer for a number of reputable international journals, Hashim Hizam, Department of Meterology and Atmospheric Sciences, faculty, University of Putra Malaysia, M.Sc in Electrical Engineering, Polytechnic University of Brooklyn, New York, M. Z. A. Ab Kadir and I. Aris, Department of Electrical and Electronics Engineering, Faculty of Engineering University Putra Malaysia, S.D. Buba professor of Climatology University of Putra Malaysia, Ph.D. paleoclimatology, University of Oxford, M.Eng at the University of Putra Malaysia, Renewable & Sustainable Energy Reviews, Vol. 16 Issue 5, “Mitigating the anthropogenic global warming in the electric power industry,” p. 1, Ebsco Host

One of the most current and widely discussed factors that could lead to the ultimate end of man’s existence and the world at large is global warming. Global warming, described as the greatest environmental challenge in the 21st century, is the increase in the average global air temperature near the surface of the Earth, caused by the gases that trap heat in the atmosphere called greenhouse gases (GHGs). These gases are emitted to the atmosphere mostly as a result of human activities, and can lead to global climate change. The economic losses arising from climate change presently valued at $125 billion annually, has been projected to increase to $600 billion per year by 2030, unless critical measures are taken to reduce the spate of GHG emissions. Globally, the power generation sector is responsible for the largest share of GHG emissions today. The reason for this is that most power plants worldwide still feed on fossil fuels, mostly coal and consequently produce the largest amount of CO2 emitted into the atmosphere. Mitigating CO2 emissions in the power industry therefore, would significantly contribute to the global efforts to control GHGs. This paper gives a brief overview of GHGs, discusses the factors that aid global warming, and examines the expected devastating effects of this fundamental global threat on the entire planet. The study further identifies the key areas to mitigate global warming with a particular focus on the electric power industry.

#### Climate change is real and anthropogenic – fundamental science, atmospheric patterns, greenhouse gas fingerprints, and newest measurements all confirm.

Karl Braganza, 6-14-2011, received his PhD from the School of Mathematics at Monash University, work has centered on understanding and attributing climate variability and change, using numerical modeling, instrumental observations and past climate evidence, currently the Head of Climate Monitoring at the Bureau of Meteorology's National Climate Center, The Conversation, "The Greenhouse Effect is Real: Here’s Why," <http://theconversation.edu.au/the-greenhouse-effect-is-real-heres-why-1515>

The greenhouse effect is fundamental science It would be easy to form the opinion that everything we know about climate change is based upon the observed rise in global temperatures and observed increase in carbon dioxide emissions since the industrial revolution. In other words, one could have the mistaken impression that the entirety of climate science is based upon a single correlation study. In reality, the correlation between global mean temperature and carbon dioxide over the 20th century forms an important, but very small part of the evidence for a human role in climate change. Our assessment of the future risk from the continued buildup of greenhouse gases in the atmosphere is even less informed by 20th century changes in global mean temperature. For example, our understanding of the greenhouse effect – the link between greenhouse gas concentrations and global surface air temperature – is based primarily on our fundamental understanding of mathematics, physics, astronomy and chemistry. Much of this science is textbook material that is at least a century old and does not rely on the recent climate record. For example, it is a scientific fact that Venus, the planet most similar to Earth in our solar system, experiences surface temperatures of nearly 500 degrees Celsius due to its atmosphere being heavily laden with greenhouse gases. Back on Earth, that fundamental understanding of the physics of radiation, combined with our understanding of climate change from the geological record, clearly demonstrates that increasing greenhouse gas concentrations will inevitably drive global warming. Dusting for climate fingerprints The observations we have taken since the start of 20th century have confirmed our fundamental understanding of the climate system. While the climate system is very complex, observations have shown that our formulation of the physics of the atmosphere and oceans is largely correct, and ever improving. Most importantly, the observations have confirmed that human activities, in particular a 40% increase in atmospheric carbon dioxide concentrations since the late 19th century, have had a discernible and significant impact on the climate system already. In the field known as detection and attribution of climate change, scientists use indicators known as fingerprints of climate change. These fingerprints show the entire climate system has changed in ways that are consistent with increasing greenhouse gases and an enhanced greenhouse effect. They also show that recent, long term changes are inconsistent with a range of natural causes. Is it getting hot in here? A warming world is obviously the most profound piece of evidence. Here in Australia, the decade ending in 2010 has easily been the warmest since record keeping began, and continues a trend of each decade being warmer than the previous, that extends back 70 years. Globally, significant warming and other changes have been observed across a range of different indicators and through a number of different recording instruments, and a consistent picture has now emerged. Scientists have observed increases in continental temperatures and increases in the temperature of the lower atmosphere. In the oceans, we have seen increases in sea-surface temperatures as well as increases in deep-ocean heat content. That increased heat has expanded the volume of the oceans and has been recorded as a rise in sea-level. Scientists have also observed decreases in sea-ice, a general retreat of glaciers and decreases in snow cover. Changes in atmospheric pressure and rainfall have also occurred in patterns that we would expect due to increased greenhouse gases. There is also emerging evidence that some, though not all, types of extreme weather have become more frequent around the planet. These changes are again consistent with our expectations for increasing atmospheric carbon dioxide. Patterns of temperature change that are uniquely associated with the enhanced greenhouse effect, and which have been observed in the real world include: greater warming in polar regions than tropical regions greater warming over the continents than the oceans greater warming of night time temperatures than daytime temperatures greater warming in winter compared with summer a pattern of cooling in the high atmosphere (stratosphere) with simultaneous warming in the lower atmosphere (troposphere).

#### Only the aff can pull us back from the edge – adequately brings down ppm amounts.

Steve Kirsch, 11-25-2009, M.S. Massachusetts Institute of Technology (MIT), writer for the Huffington Post, CEO Kirsch foundation on climate, founder/head of Center for Energy and Climate Change, National Award from the Caring Institute in Washington DC, written much about the Integral Fast Reactor, Fellow, with the Science Council for Global Initiatives (SCGI), Steve Kirsch’s blog, “Why We Should Build an Integral Fast Reactor Now,” <http://skirsch.wordpress.com/2009/11/25/ifr/>

\*\*\*cites Charles Till, former Associate Director, Argonne National Laboratory, The National Academy Studies, James Hansen, Director, NASA Goddard Institute for Space Studies, Ray Hunter, former Deputy Director of the Office of Nuclear Energy, Science and Technology in the U.S. Department of Energy (DOE), Leonard Koch, winner of the Global Energy International Prize, Barry Brook Sir Hubert Wilkins Chair of Climate Change\*\*\*

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.

#### Fast reactors are key to establishing clean power leadership – has a thirty trillion dollar return.

Steve Kirsch, 11-25-2009, M.S. Massachusetts Institute of Technology (MIT), writer for the Huffington Post, CEO Kirsch foundation on climate, founder/head of Center for Energy and Climate Change, National Award from the Caring Institute in Washington DC, written much about the Integral Fast Reactor, Fellow, with the Science Council for Global Initiatives (SCGI), Steve Kirsch’s blog, “Why We Should Build an Integral Fast Reactor Now,” <http://skirsch.wordpress.com/2009/11/25/ifr/>

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Creates an opportunity to become the world leader in clean energy. Obama said at MIT that he wants the US to be a world leader in clean power. Nuclear is the largest clean energy source and the IFR was determined to be the best nuclear power technology in the most extensive comparative nuclear study ever done. That means the IFR is, in the objective opinion of international energy experts, our single best clean power source. But we aren’t exploiting it. We are investing nothing in it today. One of the IFR scientists, an Argonne Distinguished Fellow, went to DOE recently and to ask for funds to at least start the IFR planning. He got nothing. Not even a dime. How do we expect to be a leader in clean energy by leaving our best technology sitting on the shelf? Nobody has been able to answer that. Creates enormous economic value. Because they use our existing nuclear waste as fuel, fast reactors turn our existing nuclear waste stockpile into an asset worth over $30 trillion dollars. That is an amazing return on investment for a one-time $3B investment to jump-start the technology. Nothing else provides such an enormous return on investment (ROI). Plus, the ROI is guaranteed: we know the technology works since we ran it for 30 years and we also know it is practical since the Russians are exporting commercial fast reactors to China.

#### It’s not too late.

Dana Nuccitelli, 8-31-2012, environmental scientist at a private environmental consulting firm, Bachelor's Degree in astrophysics from the University of California at Berkeley, and a Master's Degree in physics from the University of California at Davis, “Realistically What Might the Future Climate Look Like?,” <http://www.skepticalscience.com/realistically-what-might-future-climate-look-like.html>

We're not yet committed to surpassing 2°C global warming, but as Watson noted, we are quickly running out of time to realistically give ourselves a chance to stay below that 'danger limit'. However, 2°C is not a do-or-die threshold. Every bit of CO2 emissions we can reduce means that much avoided future warming, which means that much avoided climate change impacts. As Lonnie Thompson noted, the more global warming we manage to mitigate, the less adaption and suffering we will be forced to cope with in the future. Realistically, based on the current political climate (which we will explore in another post next week), limiting global warming to 2°C is probably the best we can do. However, there is a big difference between 2°C and 3°C, between 3°C and 4°C, and anything greater than 4°C can probably accurately be described as catastrophic, since various tipping points are expected to be triggered at this level. Right now, we are on track for the catastrophic consequences (widespread coral mortality, mass extinctions, hundreds of millions of people adversely impacted by droughts, floods, heat waves, etc.). But we're not stuck on that track just yet, and we need to move ourselves as far off of it as possible by reducing our greenhouse gas emissions as soon and as much as possible.

#### Global warming risks collapse in biodiversity – scaling back emission solves.

Lee Hannah, 4-19-2012, is Senior Fellow in Climate Change Biology at Conservation International’s (CI) Center for Applied Biodiversity Science, tracking role of climate change in conservation planning and methods of corridor design, heads CI’s efforts to develop conservation responses to climate change, Yale Environment 360, “As Threats to Biodiversity Grow, Can We Save World’s Species?,” http://e360.yale.edu/feature/as\_threats\_to\_biodiversity\_grow\_can\_we\_save\_worlds\_species/2518/

Now, with 7 billion people on the planet — heading to 10 billion — and with greenhouse gas emissions threatening more rapid temperature rises than the warming that brought the last Ice Age to an end, the many millions of living things on Earth face an unprecedented squeeze. Is a wave of extinctions possible, and if so, what can we do about it? The late climate scientist and biologist Stephen Schneider once described this confluence of events — species struggling to adapt to rapid warming in a world heavily modified by human action — as a “no-brainer for an extinction spasm.” My colleagues Barry Brook and Anthony Barnosky recently put it this way, “We are witnessing a similar collision of human impacts and climatic changes that caused so many large animal extinctions toward the end of the Pleistocene. But today, given the greater magnitude of both climate change and other human pressures, the show promises to be a wide-screen technicolor version of the (by comparison) black-and-white letterbox drama that played out the first time around.” The magnitude of the threat was first quantified in a 2004 Nature study, “Extinction Risk from Climate Change.” This paper suggested that in six diverse regions, 15 to 37 percent of species could be at risk of extinction. If those six regions were typical of the global risk, the study’s authors later calculated, more than a million terrestrial and marine species could face extinction due to human encroachment and climate change — assuming conservatively that 10 million species exist in the world. Headlines around the world trumpeted the 1 million figure. Whether that scenario will unfold is unclear. But signs of what is to come are already all around us: nearly 100 amphibian species in South America vanishing in a disease outbreak linked to climate change, large areas of western North American facing massive die-offs of trees because of warming-driven beetle outbreaks, and increasing loss of coral reefs worldwide because of human activities and coral bleaching events driven by rising ocean temperatures. Most of the world’s biologically unique areas have already lost more than 70 percent of their high-quality habitat. The world community has the power to greatly reduce the prospect of an extinction spasm by lowering greenhouse gas emissions and launching large-scale conservation and forest preservation programs that both slow global warming and provide a sanctuary for countless species. But progress on these fronts is slow, and pressure on the world’s biodiversity remains relentless. An important part of the solution is preserving the ability of species to move across a changing landscape. Before humans, species responded to climate change by migrating, sometimes long distances, to track their preferred climatic conditions. Fully natural landscapes were conducive to these movements, with even slow-dispersing plants shifting the heart of their range on continental scales. The mechanisms of these changes are still being worked out, but we know they happened: Insects once found in Britain are now found only in the Himalayas, and centers of oak distribution have moved from the Mediterranean to Central Europe and from Georgia to Pennsylvania. Recent studies have shown that migration was an important method for species to cope with rapid climate change as far back as 55 million years ago, a period known as the Paleocene-Eocene Thermal Maximum, or PETM. Then, for reasons that are still not entirely clear, vast amounts of greenhouse gases were released into the atmosphere and oceans, leading to an increase in global temperatures of 4 to 9 degrees C (7 to 14 degrees F) in less than 10,000 years. Geological and fossil studies, using techniques such as stable isotope analysis, show major extinctions, the evolution of new animals and plants, and the migration of species on a large scale. Now, however, landscapes are crowded with human uses. Cities, urban sprawl, and agriculture take up huge areas. Freeways and roads create long linear obstructions to natural movement and present a patchwork of obstacles that are a severe challenge to species’ natural modes of shifting to track climate. To unravel these future responses requires understanding of past response, modeling of future response, and insights from changes already underway. To date, marine systems have experienced the most extensive impacts of climate change. From coral bleaching to melting sea ice, marine systems are changing on global and regional scales. Coral bleaching occurs when water temperatures exceed regional norms, causing corals to expel symbiotic micro-organisms from their tissues, ultimately leading to morbidity or death. Bleaching has exterminated some coral species from entire ocean basins. Global extinctions may follow as temperatures continue to rise. Corals face a second threat from acidification as CO2 builds up in the atmosphere and oceans, which prevents corals and many other marine organisms, including clams and oysters, from forming their calcium carbonate shells. Overall, the evidence suggests that the world’s roughly 5 million marine species face as severe threats from climate change as their terrestrial counterparts. On land, tropical biodiversity hotspots in places such as the Amazon and the rainforests of Indonesia and Malaysia are especially at risk. All global climate models now show significant future warming in the tropics, even if more muted than warming at high latitudes. Tropical animals, insects, and plants are tightly packed along climatic gradients from lowlands to mountaintops, and these organisms are sensitive to changes in temperature and rainfall. Already, scores of amphibians in South America have disappeared as a warmer, drier climate has led to outbreaks of disease such as the chytrid fungus. At the same time, large areas of tropical forest are being cleared for timber, ranching, and farming such crops as soybeans and oil palm.

#### Biodiversity loss causes extinction.

Ruth Young, 2-9-2010, Ph.D. in coastal marine ecology, “Biodiversity: what it is and why it’s important,” <http://www.talkingnature.com/2010/02/Biodiversity/Biodiversity-what-and-why/>

Different species within ecosystems fill particular roles, they all have a function, they all have a niche. They interact with each other and the physical environment to provide ecosystem services that are vital for our survival. For example plant species convert carbon dioxide (CO2) from the atmosphere and energy from the sun into useful things such as food, medicines and timber. A bee pollinating a flower (Image: ClearlyAmbiguous Flickr) Pollination carried out by insects such as bees enables the production of ⅓ of our food crops. Diverse mangrove and coral reef ecosystems provide a wide variety of habitats that are essential for many fishery species. To make it simpler for economists to comprehend the magnitude of services offered by Biodiversity, a team of researchers estimated their value – it amounted to $US33 trillion per year. “By protecting Biodiversity we maintain ecosystem services” Certain species play a “keystone” role in maintaining ecosystem services. Similar to the removal of a keystone from an arch, the removal of these species can result in the collapse of an ecosystem and the subsequent removal of ecosystem services. The most well known example of this occurred during the 19th century when sea otters were almost hunted to extinction by fur traders along the west coast of the USA. This led to a population explosion in the sea otters’ main source of prey, sea urchins. Because the urchins graze on kelp their booming population decimated the underwater kelp forests. This loss of habitat led to declines in local fish populations. Sea otters are a keystone species once hunted for their fur (Image: Mike Baird) Eventually a treaty protecting sea otters allowed the numbers of otters to increase which inturn controlled the urchin population, leading to the recovery of the kelp forests and fish stocks. In other cases, ecosystem services are maintained by entire functional groups, such as apex predators (See Jeremy Hance’s post at Mongabay). During the last 35 years, over fishing of large shark species along the US Atlantic coast has led to a population explosion of skates and rays. These skates and rays eat bay scallops and their out of control population has led to the closure of a century long scallop fishery. These are just two examples demonstrating how Biodiversity can maintain the services that ecosystems provide for us, such as fisheries. One could argue that to maintain ecosystem services we don’t need to protect Biodiversity but rather, we only need to protect the species and functional groups that fill the keystone roles. However, there are a couple of problems with this idea. First of all, for most ecosystems we don’t know which species are the keystones! Ecosystems are so complex that we are still discovering which species play vital roles in maintaining them. In some cases its groups of species not just one species that are vital for the ecosystem. Second, even if we did complete the enormous task of identifying and protecting all keystone species, what back-up plan would we have if an unforseen event (e.g. pollution or disease) led to the demise of these ‘keystone’ species? Would there be another species to save the day and take over this role? Classifying some species as ‘keystone’ implies that the others are not important. This may lead to the non-keystone species being considered ecologically worthless and subsequently over-exploited. Sometimes we may not even know which species are likely to fill the keystone roles. An example of this was discovered on Australia’s Great Barrier Reef. This research examined what would happen to a coral reef if it were over-fished. The “over-fishing” was simulated by fencing off coral bommies thereby excluding and removing fish from them for three years. By the end of the experiment, the reefs had changed from a coral to an algae dominated ecosystem – the coral became overgrown with algae. When the time came to remove the fences the researchers expected herbivorous species of fish like the parrot fish (Scarus spp.) to eat the algae and enable the reef to switch back to a coral dominated ecosystem. But, surprisingly, the shift back to coral was driven by a supposed ‘unimportant’ species – the bat fish (Platax pinnatus). The bat fish was previously thought to feed on invertebrates – small crabs and shrimp, but when offered a big patch of algae it turned into a hungry herbivore – a cow of the sea – grazing the algae in no time. So a fish previously thought to be ‘unimportant’ is actually a keystone species in the recovery of coral reefs overgrown by algae! Who knows how many other species are out there with unknown ecosystem roles! In some cases it’s easy to see who the keystone species are but in many ecosystems seemingly unimportant or redundant species are also capable of changing niches and maintaining ecosystems. The more Biodiversityiverse an ecosystem is, the more likely these species will be present and the more resilient an ecosystem is to future impacts. Presently we’re only scratching the surface of understanding the full importance of Biodiversity and how it helps maintain ecosystem function. The scope of this task is immense. In the meantime, a wise insurance policy for maintaining ecosystem services would be to conserve Biodiversity. In doing so, we increase the chance of maintaining our ecosystem services in the event of future impacts such as disease, invasive species and of course, climate change. This is the international year of Biodiversity – a time to recognize that Biodiversity makes our survival on this planet possible and that our protection of Biodiversity maintains this service.

#### Causes rampant disease spread.

Kirsten Adair, 4-22-2012, Yale Law, Yale Daily News, “Global warming may intensify disease,” <http://www.yaledailynews.com/news/2012/apr/11/global-warming-may-intensify-disease/>

\*\*\*cites Gerald Friedland, professor of medicine and epidemiology and public health at the Yale School of Medicine\*\*\*

According to several leading climate scientists and public health researchers, global warming will lead to higher incidence and more intense versions of disease. The direct or indirect effects of global warming might intensify the prevalence of tuberculosis, HIV/AIDS, dengue and Lyme disease, they said, but the threat of increased health risks is likely to futher motivate the public to combat global warming. “The environmental changes wrought by global warming will undoubtedly result in major ecologic changes that will alter patterns and intensity of some infectious diseases,” said Gerald Friedland, professor of medicine and epidemiology and public health at the Yale School of Medicine. Global warming will likely cause major population upheavals, creating crowded slums of refugees, Friedland said. Not only do areas of high population density facilitate disease transmission, but their residents are more likely to be vulnerable to disease because of malnutrition and poverty, he said. This pattern of vulnerability holds for both tuberculosis and HIV/AIDS, increasing the incidence of both the acquisition and spread of the diseases, he explained. He said these potential effects are not surprising, since tuberculosis epidemics historically have followed major population and environmental upheavals. By contrast, global warming may increase the infection rates of mosquito-borne diseases by creating a more mosquito-friendly habitat. Warming, and the floods associated with it, are like to increase rates of both malaria and dengue, a debilitating viral disease found in tropical areas and transmitted by mosquito bites, said Maria Diuk-Wasser, assistant professor of epidemiology at the Yale School of Public Health. “The direct effects of temperature increase are an increase in immature mosquito development, virus development and mosquito biting rates, which increase contact rates (biting) with humans. Indirect effects are linked to how humans manage water given increased uncertainty in the water supply caused by climate change,” Diuk-Wasser said.

#### New-type infectious disease spread causes extinction.

Victoria Yu, 5-22-2009, Dartmouth Journal of Science, “Human Extinction: The Uncertainty of Our Fate,” http://dujs.dartmouth.edu/spring-2009/human-extinction-the-uncertainty-of-our-fate

A pandemic will kill off all humans. In the past, humans have indeed fallen victim to viruses. Perhaps the best-known case was the bubonic plague that killed up to one third of the European population in the mid-14th century (7). While vaccines have been developed for the plague and some other infectious diseases, new viral strains are constantly emerging — a process that maintains the possibility of a pandemic-facilitated human extinction. Some surveyed students mentioned AIDS as a potential pandemic-causing virus. It is true that scientists have been unable thus far to find a sustainable cure for AIDS, mainly due to HIV’s rapid and constant evolution. Specifically, two factors account for the virus’s abnormally high mutation rate: 1. HIV’s use of reverse transcriptase, which does not have a proof-reading mechanism, and 2. the lack of an error-correction mechanism in HIV DNA polymerase (8). Luckily, though, there are certain characteristics of HIV that make it a poor candidate for a large-scale global infection: HIV can lie dormant in the human body for years without manifesting itself, and AIDS itself does not kill directly, but rather through the weakening of the immune system. However, for more easily transmitted viruses such as influenza, the evolution of new strains could prove far more consequential. The simultaneous occurrence of antigenic drift (point mutations that lead to new strains) and antigenic shift (the inter-species transfer of disease) in the influenza virus could produce a new version of influenza for which scientists may not immediately find a cure. Since influenza can spread quickly, this lag time could potentially lead to a “global influenza pandemic,” according to the Centers for Disease Control and Prevention (9). The most recent scare of this variety came in 1918 when bird flu managed to kill over 50 million people around the world in what is sometimes referred to as the Spanish flu pandemic. Perhaps even more frightening is the fact that only 25 mutations were required to convert the original viral strain — which could only infect birds — into a human-viable strain (10).

### plan

#### Plan: The United States Federal Government should substantially increase commercial loan guarantees to develop and deploy Power Reactor Innovative Small Module reactors for the purpose of energy production in the United States.

### 1AC solvency

#### Loan guarantees are key to establishing PRISM reactors.

Stephen Berry & George S. Tolley, 11-29-2010, James Franck Distinguished Service Professor Emeritus at the University of Chicago, Fellow, American Academy of Arts and Sciences, foreign Member, Royal Danish Academy of Sciences, member and Home Secretary, National Academy of Sciences, J. Heyrovsky Honorary Medal for Merit in the Chemical Sciences, Academy of Sciences of the Czech Republic, Alexander von Humboldt-Stiftung Senior Scientist Award, Phi Beta Kappa National Lecturer, George S. Tolley is a professor emeritus in Economics at the University of Chicago, fellow, American Association for the Advancement of Science, honorary editor, Resource and Energy Economics, honorary Ph.D., North Carolina State University, “Nuclear Fuel Reprocessing Future Prospects and Viability,” p. 38, <http://humanities.uchicago.edu/orgs/institute/bigproblems/Team7-1210.pdf>

The construction of an aqueous solvent extraction plant would be out of date, especially when the more promising option of pyroprocessing is on the horizon. In comparison, to current available methods, pyroprocessing produces virtually no waste, can be done on-site, and offers the option of fabricating proliferation resistant fuel from plutonium as well as uranium. The second question in regard to domestic reprocessing is, “how much direct involvement should the government have in the reprocessing business?” Government involvement could be justified on the grounds of the externalities present in nuclear waste disposal. This could take on a variety of forms - government research efforts, subsidizing reprocessing (or offering tax credits and loan guarantees), or even operating a reprocessing center on its own. Through its actions, the government will be able to influence the development and growth of the nuclear reprocessing industry in the United States. These efforts in support of pyroprocessing and other advanced fuel cycle technologies represent a small portion of the Department of Energy budget - only $142,652,000 out of a total of $33,856,453,000 in discretionary funding in FY 2009, or less than half of one percent98. Furthermore, private companies do not have sufficient independent incentives to reduce the long-term health and environmental consequences of nuclear waste disposal. While it is beyond the scope of this paper to present a formal costbenefit analysis of R&D efforts, given the minimal costs and the large potential benefits, the chances of success do not need to be very high to justify continued government expenditures in this area.

#### PRISM’s are at low cost and have expedited construction because of a pre-licensed design – solves emission problems.

Magdi Ragheb, 3-9-2012, Ph.D., Nuclear Engineering/Computer Sciences, Univ. of Wisconsin, Associate Professor, Interdisciplinary Research Center, National Center for Supercomputing Applications (NCSA), Univ. of Illinois at Urbana-Champaign, Fusion Research Program, Univ. of Wisconsin, Department of Nuclear Engineering, Brookhaven National Laboratory, “RESTARTING THE STALLED USA NUCLEAR RENAISSANCE,” <https://netfiles.uiuc.edu/mragheb/www/NPRE%20402%20ME%20405%20Nuclear%20Power%20Engineering/Restarting%20the%20USA%20Stalled%20Nuclear%20Renaissance.pdf>

GE Hitachi Nuclear Energy, GEH next evolution of the Na cooled reactor technology is the Power Reactor Innovative Small Modular, PRISM reactor concept. The use of Na as a coolant allows for a fast neutrons spectrum in the core allowing breeding; hence a long time between refuellings. In addition, the hard neutron spectrum fissions the transuranic elements produced in the U-Pu fuel cycle, converting them into shorter lived fission products. This produces useful energy as well as reduces the volume and complexity of the U-Pu cycle waste disposal problem. The concept can also be used for consuming the transuranics in used nuclear fuel from water cooled reactors. Sodium-cooled reactors enjoy a safety aspect of operating at low pressure compared with light water cooled reactors. The PRISM reactor employs passive safety design features. Its simple design, allows factory fabrication with modular construction and ultimately lower costs. Passive core cooling is used enhancing the reactor’s safety. The residual or decay heat is passively released to the atmosphere with the elimination of active safety systems. Electromagnetic pumps without moving parts are used, eliminating valves and motors used in other nuclear island designs. The standardized modular design allows for an expedited construction schedule due to pre-licensed design, and factory fabrication. PRISM has a reference construction schedule of 36 months. A single PRISM power block generating 622 MWe the same amount of electricity generated in the USA through conventional sources would reduce greenhouse gas emissions by an amount equivalent to taking 700,000 cars off the road while at the same time offering the possibility of acting as an actinides burner consuming LWRs used nuclear fuel.

#### PRISM could be developed in five years – other reprocessing alternatives create worse waste problems.

Fred Pearce, 8-8-2012, is a freelance author and journalist based in the UK, he serves as environmental consultant for New Scientist magazine and is the author of numerous books, including When The Rivers Run Dry and With Speed and Violence, in previous articles for Yale Environment 360, environment 360, Breakthrough Institute, “Nuclear Fast Reactor: The Saviour of Nuclear Power?,” <http://oilprice.com/Alternative-Energy/Nuclear-Power/Nuclear-Fast-Reactor-The-Saviour-of-Nuclear-Power.html>

The PRISM fast reactor is attracting friends among environmentalists formerly opposed to nuclear power. They include leading thinkers such as Stewart Brand and British columnist George Monbiot. And, despite the cold shoulder from the Obama administration, some U.S. government officials seem quietly keen to help the British experiment get under way. They have approved the export of the PRISM technology to Britain and the release of secret technical information from the old research program. And the U.S. Export-Import Bank is reportedly ready to provide financing. Britain has not made up its mind yet, however. Having decided to try and re-use its stockpile of plutonium dioxide, its Nuclear Decommissioning Authority has embarked on a study to determine which re-use option to support. There is no firm date, but the decision, which will require government approval, should be reached within two years. Apart from a fast-breeder reactor, the main alternative is to blend the plutonium with other fuel to create a mixed-oxide fuel (mox) that will burn in conventional nuclear power plants. Britain has a history of embarrassing failures with mox, including the closure last year of a $2 billion blending plant that spent 10 years producing a scant amount of fuel. And critics say that, even if it works properly, mox fuel is an expensive way of generating not much energy, while leaving most of the plutonium intact, albeit in a less dangerous form. Only fast reactors can consume the plutonium. Many think that will ultimately be the UK choice. If so, the PRISM plant would take five years to license, five years to build, and could destroy probably the world's most dangerous stockpile of plutonium by the end of the 2020s. GEH has not publicly put a cost on building the plant, but it says it will foot the bill, with Proponents of fast reactors see them as the nuclear application of one of the totems of environmentalism: recycling. the British government only paying by results, as the plutonium is destroyed. The idea of fast breeders as the ultimate goal of nuclear power engineering goes back to the 1950s, when experts predicted that fast-breeders would generate all Britain's electricity by the 1970s. But the Clinton administration eventually shut down the U.S.'s research program in 1994. Britain followed soon after, shutting its Dounreay fast-breeder reactor on the north coast of Scotland in 1995. Other countries have continued with fast-breeder research programs, including France, China, Japan, India, South Korea, and Russia, which has been running a plant at Sverdlovsk for 32 years.

#### It’s the only reactor that is ready for commercial deployment – comparatively better to meet all necessary goals.

Barry Brook & Tom Blees, 10-23-2012, a leading environmental scientist, holding the Sir Hubert Wilkins Chair of Climate Change at the School of Earth and Environmental Sciences, and is also Director of Climate Science at the University of Adelaide’s Environment Institute, published three books, over 200 refereed scientific papers, is a highly cited researcher, received a number of distinguished awards for his research excellence including the Australian Academy of Science Fenner Medal, is an International Award Committee member for the Global Energy Prize, Australian Research Council Future Fellow, ISI Researcher, Ph.D., Macquarie University in Environmental Engineering, Science Council for Global Initiatives, Edgeworth David Medal Royal Society of NSW, Cosmos Bright Sparks Award, Tom Blees is the author of Prescription for the Planet, the president of the Science Council for Global Initiatives, member of the selection committee for the Global Energy Prize, BraveNewClimate, “The Case for Near-term Commercial Demonstration of the Integral Fast Reactor,” <http://bravenewclimate.com/2012/10/23/the-case-for-near-term-commercial-demonstration-of-the-integral-fast-reactor/>

The conferees also touched on other fast reactor and thermal reactor systems being considered today, in varying degrees of development: molten fluoride salt thorium reactors (LFTRs), liquid-salt-cooled pebble fuel systems, etc. [16] While some of these hold promise, none are near the level of readiness for near-term commercial-prototype deployment as the PRISM reactor and its metal-fuel technology. In addition, none of the immediate prospects can match the IFR concept in meeting all the goals of the Gen IV initiative.

## 2AC

### 2AC topicality – ‘For’

#### We meet - loan guarantees are financial incentives for energy.

Kernaghan Webb, 1993, lecturer in the Faculty of Law at the University of Ottawa, “Thumbs, Fingers, and Pushing on String: Legal Accountability in the Use of Federal Financial Incentives,” Lexis Nexis

In this paper, "financial incentives" are taken to mean disbursements 18 of public funds or contingent commitments to individuals and organizations, intended to encourage, support or induce certain behaviors in accordance with express public policy objectives. They take the form of grants, contributions, repayable contributions, loans, loan guarantees and insurance, subsidies, procurement contracts and tax expenditures.19 Needless to say, the ability of government to achieve desired behavior may vary with the type of incentive in use: up-front disbursements of funds (such as with contributions and procurement contracts) may put government in a better position to dictate the terms upon which assistance is provided than contingent disbursements such as loan guarantees and insurance. In some cases, the incentive aspects of the funding come from the conditions attached to use of the monies.20 In others, the mere existence of a program providing financial assistance for a particular activity (eg. low interest loans for a nuclear power plant, or a pulp mill) may be taken as government approval of that activity, and in that sense, an incentive to encourage that type of activity has been created.21 Given the wide variety of incentive types, it will not be possible in a paper of this length to provide anything more than a cursory discussion of some of the main incentives used.22

#### C/I - Financial incentives include loan guarantees - distinguished from rules, regulations and policies.

DSIRE (Database of State Incentives for Renewables & Efficiency), 2012, Database of State Incentives for Renewables & Efficiency, Glossary, “Financial Incentives,” http://www.dsireusa.org/glossary/

DSIRE organizes incentives and policies that promote renewable energy and energy efficiency into two general categories -- (1) Financial Incentives and (2) Rules, Regulations & Policies -- and roughly 30 specific types of incentives and policies. This glossary provides a description of each specific incentive and policy type. FINANCIAL INCENTIVES (click to expand section) Corporate Tax Incentives Corporate tax incentives include tax credits, deductions and exemptions. These incentives are available in some states to corporations that purchase and install eligible renewable energy or energy efficiency equipment, or to construct green buildings. In a few cases, the incentive is based on the amount of energy produced by an eligible facility. Some states allow the tax credit only if a corporation has invested a minimum amount in an eligible project. Typically, there is a maximum limit on the dollar amount of the credit or deduction. In recent years, the federal government has offered corporate tax incentives for renewables and energy efficiency. (Note that corporate tax incentives designed to support manufacturing and the development of renewable energy systems or equipment, or energy efficiency equipment, are categorized as “Industry Recruitment/Support” in DSIRE.)Grant Programs States offer a variety of grant programs to encourage the use and development of renewables and energy efficiency. Most programs offer support for a broad range of technologies, while a few programs focus on promoting a single technology, such as photovoltaic (PV) systems. Grants are available primarily to the commercial, industrial, utility, education and/or government sectors. Most grant programs are designed to pay down the cost of eligible systems or equipment. Others focus on research and development, or support project commercialization. In recent years, the federal government has offered grants for renewables and energy efficiency projects for end-users. Grants are usually competitive. Green Building Incentives Green buildings are designed and constructed using practices and materials that minimize the impacts of the building on the environment and human health. Many cities and counties offer financial incentives to promote green building. The most common form of incentive is a reduction or waiver of a building permit fee. The U.S. Green Building Council’s Leadership in Energy and Environmental Design (LEED) is a popular point-based certification program for green buildings. The LEED system awards points for site selection and development; material, energy and water efficiency; indoor air quality; innovation; and the application of renewable technologies. (Note that this category includes green building incentives that do not fall under other DSIRE incentive categories, such as tax incentives and grant programs.)Industry Recruitment/Support To promote economic development and the creation of jobs, some states offer financial incentives to recruit or cultivate the manufacturing and development of renewable energy systems and equipment. These incentives commonly take the form of tax credits, tax exemptions and grants. In some cases, the amount of the incentive depends on the quantity of eligible equipment that a company manufactures. Most of these incentives apply to several renewable energy technologies, but a few states target specific technologies, such as wind or solar. These incentives are usually designed as temporary measures to support industries in their early years. They commonly include a sunset provision to encourage the industries to become self-sufficient. Loan Programs Loan programs provide financing for the purchase of renewable energy or energy efficiency systems or equipment. Low-interest or zero-interest loans for energy efficiency projects are a common demand-side management (DSM) practice for electric utilities. State governments also offer low-interest loans for a broad range of renewable energy and energy efficiency measures. These programs are commonly available to the residential, commercial, industrial, transportation, public and/or non-profit sectors. Loan rates and terms vary by program; in some cases, they are determined on an individual project basis. Loan terms are generally 10 years or less. In recent years, the federal government has offered loans and/or loan guarantees for renewables and energy efficiency projects. PACE Financing Property-Assessed Clean Energy (PACE) financing effectively allows property owners to borrow money to pay for renewable energy and/or energy-efficiency improvements. The amount borrowed is typically repaid over a period of years via a special assessment on the owner's property. In general, local governments (such as cities and counties) that choose to offer PACE financing must be authorized to do so by state law. Performance-Based Incentives Performance-based incentives (PBIs), also known as production incentives, provide cash payments based on the number of kilowatt-hours (kWh) or BTUs generated by a renewable energy system. A "feed-in tariff" is an example of a PBI.

#### C/I - Used in the topic, ‘for’ is a prepositional verb meaning to wish something to be obtained.

Merriam Webster’s, 2012, <http://dictionary.reference.com/browse/for>

For; prepositional verb - used to express a wish, as of something to be experienced or obtained.

### prolif adv

#### Cooperation with India with GNEP solves.

Robert Legvold, 10-13-2006, Professor of Political Science at Columbia University, New York, Global Affairs, “Russia in Global Affairs, U.S.-Russian Relations: An American Perspective,” <http://eng.globalaffairs.ru/numbers/17/1074.html>

More likely, for the next several years, the two leaderships will propel the relationship along one of two paths: either the status quo plus or the status quo minus. In the first case, the uneasy balance between cooperation and discord will continue, from time to time boosted by new enterprises, such as the recent “Global Initiative to Combat Nuclear Terrorism” or the new merger of the U.S. “Global Nuclear Energy Partnership” with the Russian initiative to create multilateral centers for the provision of nuclear fuel cycle service. Perhaps, if each tries to find the positive in the other side’s positions, they could even enlarge the field of their foreign policy cooperation. Handled skillfully, the U.S. commitment to ready Ukraine for NATO membership, given the inevitable delay as Ukraine sorts out its own domestic scene, need not bruise U.S.-Russian relations. Or, if Russia tires further of Belarus’ reactionary regime, it may, for perfectly selfish reasons, knock from under Alexander Lukashenko the support allowing him to thumb his nose at the United States and Europe. Provided neither Russia nor the United States attempts to force fundamental choices on Kazakhstan and given the United States receding security presence in the region, Central Asia seems unlikely to threaten the relationship, and, as a quarter where U.S., Russian, and Chinese concerns over terrorism physically intersect, may even reinforce at least one area of cooperation. In the crucial case of China, the considerable parallelism in Russian and Chinese foreign policy will surely continue, but a full-blown alliance directed against the United States, impossible today – because, even if Moscow wanted it, which it does not, the Chinese have the final say – will remain so, unless the United States brings it about through a reckless policy toward China. The other rising power, India, seems certain to grow in importance for both countries, but, notwithstanding their already evident efforts to curry favor in Delhi, little either can do is likely to have great resonance in their own bilateral relationship. Finally, the increasing thrusting and parrying over domestic trends within Russia has only limited potential to seriously sour relations, if the Americans continually treat it as a back-burner issue subordinated to other things they want from the Russians – as has been true this summer, including the July G8 meeting – and/or Putin continues to brush the importuning aside with an awkward sense of humor.

### 2AC states CP

#### States acting now to provide incentives - won’t work without a sustained federal commitment.

Frank Bowman, 6-19-2008, a retired four-star Admiral, is the former Chief of Naval Personnel and former Director of Naval Nuclear Propulsion, an Honorary Knight Commander of the Most Excellent Order of the British Empire (KBE), Master's Degree in nuclear engineering and naval architecture/marine engineering at the Massachusetts Institute of Technology, Honorary Doctorate of Humane Letters from Duke University, CQ Congressional Testimony, “Greenhouse Gas Emission Reduction,” Lexis Nexis

In terms of new nuclear plant construction, one of the most significant financing challenges is the cost of these projects relative to the size, market value and financing capability of the companies that will build them. New nuclear power plants are expected to cost at least $6 to 7 billion. U.S. electric power companies do not have the size, financing capability or financial strength to finance new nuclear power projects on balance sheet, on their own-particularly at a time when they are investing heavily in other generating capacity, transmission and distribution infrastructure, and environmental controls. These first projects must have financing support-either loan guarantees from the federal government or assurance of investment recovery from state governments, or both. The states are doing their part. Throughout the South and Southeast, state governments have enacted legislation or implemented new regulations to encourage new nuclear plant construction. Comparable federal government commitment is essential. The modest loan guarantee program authorized by the 2005 Energy Policy Act was a small step in the right direction, but it does not represent a sufficient response to the urgent need to rebuild our critical electric power infrastructure. We believe the United States will need something similar to the Clean Energy Bank concept now under consideration by a number of members of Congress-a government corporation, modeled on the Export-Import Bank and the Overseas Private Investment Corporation, to provide loan guarantees and other forms of financing support to ensure that capital flows to clean technology deployment in the electric sector. Creation of such a financing entity should be an integral component of any climate change legislation. Such a concept serves at least two national imperatives. First, it addresses the challenge mentioned earlier-the disparity between the size of these projects relative to the size of the companies that will build them. In the absence of a concept like a Clean Energy Bank, new nuclear plants and other clean energy projects will certainly be built, but in smaller numbers over a longer period of time. Second, federal loan guarantees provide a substantial consumer benefit. A loan guarantee allows more leverage in a project's capital structure, which reduces the cost of capital, in turn reducing the cost of electricity from the project. Electricity consumers-residential, commercial and industrial-are already struggling with increases in oil, natural gas and electricity prices. The high cost of energy and fuel price volatility has already compromised the competitive position of American industry. We know that the next generation of clean energy technologies will be more costly than the capital stock in place today. In this environment, we see a compelling case for federal financing support that would reduce consumer costs. If it is structured like the loan guarantee program authorized by Title XVII of the 2005 Energy Policy Act, in which project sponsors are expected to pay the cost of the loan guarantee, such a program would be revenue-neutral and would not represent a subsidy. The public benefits associated with a robust energy loan guarantee program-lower cost electricity, deployment of clean energy technologies at the scale necessary to reduce carbon emissions-are significant. That is why the U.S. government routinely uses loan guarantee programs to support activities that serve the public good and the national interest-including shipbuilding, steelmaking, student loans, rural electrification, affordable housing, construction of critical transportation infrastructure, and for many other purposes. Achieving significant expansion of nuclear power in the United States will require stable and sustained federal and state government policies relating to nuclear energy. The new nuclear power projects now in the early stages of development will not enter service until the 2016-2020. Like all other advanced energy technologies, continued progress requires sustained policy and political support. In closing let me assure you that the U.S. nuclear industry is moving forward as quickly as we are able to license, finance and build new nuclear plants in the United States. Seventeen companies or groups of companies are preparing license applications for as many as 31 new reactors. Nine applications for construction and operating licenses are currently under review by the Nuclear Regulatory Commission for a total of 15 new plants. We expect four to eight new U.S. nuclear plants in operation by 2016 or so. Assuming those first plants are meeting their construction schedules and cost estimates, the rate of construction would accelerate thereafter. With the necessary investment stimulus and financing support, we could see approximately 20,000 MW of new nuclear capacity (that would be about 15 plants) on line in the 2020 to 2022 time frame, and 65,000 to 70,000 megawatts (or 45 to 50 plants) by 2030. These plants will produce clean, safe, reliable electricity, around the clock, at a stable price, immune to price volatility in the oil and natural gas markets.

#### Federal loan guarantees is the vital to investment in nuclear power.

Joe C. Turnage et. al, 7-2-2007, Senior Vice President, Constellation Energy Group Inc., Theodore Bunting Jr., Senior Vice President of Finance, Entergy Corp, John F Young, Executive Vice President and CFO, Exelon Corp, and Steve Winn, Executive Vice President, NRG Energy, Inc., “Join Comments of Constellation Group, Inc, Entergy Corporation, Exelon Corporation, and NRG Energy, Inc. regarding Proposed Rule, Loan Guarantees for Projects that Employ Innovative Technologies,” <http://www.lgprogram.energy.gov/nopr-comments/comment41.pdf>

Following the enactment of the Energy Policy Act of 2005, numerous companies announced plans to develop applications to be submitted to the U.S. Nuclear Regulatory Commission to obtain licenses for the development of new nuclear power generation facilities. NRC has developed a new "one step" licensing process for nuclear projects, where applicants would receive a combined construction and operating license or "COL," and it is hoped that this will provide a transparent and predictable licensing process which will be demonstrated with the first "wave" of COL applications. These projects involve new nuclear plants using advanced technologies of five advanced reactor designs that promise to be even safer and more reliable than the existing "fleet" of nuclear reactors. In this first stage of development, the companies at the leading edge of development are committing many tens of millions of dollars to the NRC licensing process for COL applications that will be submitted later this year and in 2008. NRC's review process is then expected to take 2-4 years, which would lead to full scale construction activities commencing in the 2009-2012 time-frame for the first units of each new technology type. Given the nature of the multi-year licensing and construction schedule, as well as the world-wide competition for resources required to build these nuclear plants, companies planning to build the first plants are already beginning the process of committing to these projects what will likely be the first several hundred million dollars for each multi-billion dollar project, and in some cases, companies with their project partners have already spent such amounts. This means that in the near-term, these companies will need to either secure financing or commit equity in order to maintain schedules to prepare for plant construction. Significantly, however, newly all of these efforts are premised upon the assumption that the promise of Title XVII of EP Act 2005 will be realized for the first wave of new nuclear plants. These companies strongly believe that loan guarantees are necessary to access the credit markets. In addition, for new nuclear facilities that will be subject to cost-of-service regulation, companies will need to demonstrate to state public service commissions that the financing costs for these facilities were prudently incurred. Simply put, further commitment of capital requires that companies secure confidence that DOE will develop and implement a workable loan guarantee program to provide the badly needed access to large amounts of capital necessary to finance the development of the first 3-5 plants of each of the new reactor designs. For some companies, this may require securing loan guarantee commitments as soon as 2008, shortly after NRC has accepted a COL application as "administratively complete" and "docketed" the application. At a minimum, however, this requires the clear and unambiguous availability of loan guarantees in the 2009-2012 timeframe for a significant number of capital intensive central power generation facilities (new nuclear and clean coal plants). A workable loan guarantee program necessary to support new nuclear power development in the U.S. must have the following three elements: The guarantee itself must be a commercially viable financing instrument, in line with other Federal loan guarantee instruments; There should be a transparent methodology for calculating the subsidy cost to be paid by sponsors, and such costs should be reasonable and commercially viable; and There should be certainty as to the future availability of guarantees, and this self-pay program should be insulated from the uncertainty of the annual appropriations process. The size and scale of nuclear projects, and the multi-year commitments that need to be made by private industry, make it imperative that DOE create certainty in the near-term around the future availability of the Title XVII Loan Guarantee Program for nuclear power projects. As part of the public-private partnership that has been essential to "jump-starting" the development of new, base-load nuclear generation, the multi-year commitment being made by private parties needs to be matched with a multi-year commitment from the federal government. The federal government cannot expect private parties to make hundreds of millions of dollars in commitments premised upon the expectation of they will obtain loan guarantees in 2009-2012 without reasonable progress being made by the federal government toward establishing a program that can be expected to be available to facilitate the financing of the first wave of new nuclear plants throughout the next five years.

#### Federal funds drive private investment and recruitment of skilled workers for IFRs.

Daniel Kammen, 6-12-2003, professor of nuclear engineering at Berkeley, Federal News Service, Prepared Testimony before the House Committee on Science, Lexis Nexis

The federal government plays the pivotal role in the encouragement of innovation in the energy sector. Not only are federal funds critical, but as my work and that of others has demonstrated6, private funds generally follow areas of public sector support. One particularly useful metric although certainly not the only measure --. of the relationship between funding and innovation is based on patents. Total public sector funding and the number of patents - across all disciplines in the United States have both increased steadily over at least the past three decades (Figure 5). The situation depicted here, with steadily increasing trends for funding and results (measured imperfectly, but consistently, by patents) is not as rosy when energy R&D alone is considered. In that case the same close correlation exists, but the funding pattern has been one of decreasing resources (Figure 6A). Figure 6A shows energy funding levels (symbol: o) and patents held by the national laboratories (symbol: ). The situation need not be as bleak as it seems. During the 1980s a number of changes in U.S. patent law permitted the national laboratories to engage in patent partnerships with the private sector. This increased both the interest in developing patents, and increased the interest by the private sector in pursuing patents on energy technologies. The squares (l) in figure 6 show that overall patents in the energy sector derived. Figure 6B reveals that patent levels in the nuclear field have declined, but not only that, public private partnerships have taken placed (shaded bars), but have not increased as dramatically as in energy field overall (Figure 6A). There are a number of issues here, so a simple comparison of nuclear R&D to that on for example, fuel cells, is not appropriate. But it is a valid to explore ways to increase both the diversity of the R&D. This is a particularly important message for federal policy. Novel approaches are needed to encourage new and innovative modes of research, teaching, and industrial innovation in the nuclear energy field. To spur innovation in nuclear science a concerted effort would be needed to increase the types and levels of cooperation by universities and industries in areas that depart significantly from the current 'Generation III+' and equally, away from the 'Generation IV' designs. Similar conclusions were reached by M. Granger Morgan, head of the Engineering and Public Policy Program at Carnegie Mellon University, in his evaluation of the need for innovative in the organization and sociology of the U. S. nuclear power industry’s. A second important issue that this Committee might consider is the degree of federal support for nuclear fission relative to other nations. Funding levels in the U.S. are significantly lower than in both Japan and France. Far from recommending higher public sector funding, what is arguably a more successful strategy would be to increase the private sector support for nuclear R&D and student training fellowships. Importantly, this is precisely the sort of expanded public private partnership that has been relatively successful in the energy sector generally. It is incorrect, however, to think that this is a process that can be left to the private sector. There are key issues that inhibit private sector innovation. As one example, many nuclear operating companies have large coal assets, and thus are unlikely to push overly hard, in areas that threaten another core business. This emphasis on industry resources used to support and expanded nuclear program - under careful public sector management - has-been echoed by a variety of nuclear engineering faculty members: I believe that if you. were to survey nuclear engineering department heads, most would select a national policy to support new nuclear construction, over a policy to increase direct financial support to nuclear engineering departments. A firm commitment by the federal government, to create incentives sufficient to ensure the construction of a modest number of new nuclear plants, with the incentives reduced for subsequent plants, would be the best thing that could possibly be done for nuclear engineering education and revitalization of the national workforce for nuclear science and technology. - Professor Per Peterson, Chair, Department of Nuclear Engineering, University of California, Berkeley

### 2AC oil dependence good DA

#### Russian economy growing and resilient – assumes current global crisis.

Reuters, 10-25-2011, “Update 1-Russian economic growth gains speed in Q3,” <http://www.reuters.com/article/2011/10/25/russia-economy-idUSL5E7LP46T20111025>

Russia's gross domestic product (GDP) grew 5.1 percent in the third-quarter, the economy ministry said on Tuesday, with the figure meeting analyst expectations and suggesting economic expansion has gained speed in recent months. In September, GDP grew 5.7 percent year-on-year, Deputy Economy Minister Andrei Klepach said, which follows a 5.2 percent rise in August. "The third quarter was fairly positive for the economy ... we can talk about growth gaining in pace," Klepach told reporters. Reuters most recent poll showed that economists expect third-quarter economic expansion to reach 5.1 percent in annual terms. The data suggests that the country is on track to achieve official forecasts of 4.1 percent GDP growth this year. Klepach said that the ministry expects GDP growth to slow down in the fourth quarter to 3.8-3.9 percent. The GDP data follows largely positive news from last week that showed Russia's economy remains seemingly resilient despite global economic turmoil and disappointing industrial output in September.

#### No impact to Russian economic decline.

Robert Blackwill, 2009, former associate dean of the Kennedy School of Government and Deputy Assistant to the President and Deputy National Security Advisor for Strategic Planning, RAND, “The Geopolitical Consequences of the World Economic Recession—A Caution”, <http://www.rand.org/pubs/occasional_papers/2009/RAND_OP275.pdf>

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.

#### Imports have decreased to record lows now – without a new energy paradigm however coming price shocks will cause hollow out of the economy.

Gal Luft & Anne Korin, July/August 2012, co-directors of the Institute for the Analysis of Global Security (IAGS) and senior advisers to the United States Energy Security Council, They are co-authors of Turning Oil into Salt: Energy Independence through Fuel Choice and Petropoly: The Collapse of America’s Energy Security Paradigm, The American Interest, “The Folly of Energy Independence,” <http://www.the-american-interest.com/article.cfm?piece=1266>

In recent years America’s volume of imported oil has dropped significantly even as the price we have paid and are still paying for it has sharply increased. It follows, then, that the policy options we ought to consider differ significantly from those of the past half century. Yet there seems to be something seriously the matter with our mental clutch. We’re stuck in the wrong gear, and we’re not getting anywhere. That needs to change, now. Up to Speed To understand more fully what the problem is and what we need to do about it, consider that in recent years America’s energy landscape has turned a corner—not thanks to, but largely despite, the actions of the U.S. government. U.S. net imports of petroleum declined from 12.5 million barrels per day (mbd) in 2005 to 8.6 mbd in 2011. U.S. import dependence dropped from its 60 percent peak in 2005 to 46 percent, the level it was back in 1995. This 30 percent reduction in just seven years in the level of imports is equivalent to three times the number of barrels nominally imported from Saudi Arabia. Some of the reduction is due to a recession-induced drop in consumption; some has to do with increased vehicle fuel efficiency standards; some with a ramp up in ethanol blending; and some with a ramp up in domestic oil production. Since 2008, technologies like deep-water drilling, hydraulic fracturing and horizontal drilling have increased U.S. crude oil output by 18 percent. In the past year alone, the U.S. onshore rig count has grown by 30 percent. About a million barrels per day emerged from a new source, tight oil, which is extracted from dense rocks. North Dakota, the center of the tight oil transformation, has become the fourth largest oil-producing state behind Texas, Alaska and California. For the first time in decades, the United States is experiencing an oil boom—or at least a boomlet. But while America’s oil imports dropped, its foreign oil expenditures climbed by almost 50 percent, from $247 billion in 2005 to $367 billion in 2011. The share of oil imports in the overall trade deficit grew from 32 percent in 2005 to 58 percent in 2011. The price of a gallon of regular gasoline nearly doubled. Despite lower demand, U.S. drivers spent more last year on gasoline than in any prior year. Clearly, and surprisingly to those trapped in old ways of thinking, the volume of U.S. imports and the cost of those imports have moved in opposite directions. While America became more self-sufficient and more fuel-efficient, it became poorer and got deeper in debt. If one accepts the traditional mantra of energy security as “availability of sufficient supply at affordable prices”, then whatever points we gained on the availability front were offset by those lost on the affordability side of the ledger. The latter matters more—especially in a time of economic adversity. All but two of the post-World War II recessions were preceded by a sharp spike in oil prices; there is no question that the fivefold increase in oil prices since 2003 has contributed to the current economic dislocation. For perspective, forty years ago, at the zenith of the Cold War, the United States spent $4 billion on oil imports, an amount that equaled 1.2 percent of the defense budget. In 2006, the United States paid $296 billion, equal to half of the defense budget. By 2008, U.S. foreign oil expenditures grew so much they almost equaled the entire defense budget. The energy security paradox of the 21st century, then, is that a country can reduce oil imports but end up paying a much higher oil import bill. What this means is that, given the current state of the global economy, a new oil shock—whether caused by war in the Persian Gulf, instability in North Africa or Nigeria, or even anxious investors rushing to buy oil futures to hedge against falling currencies—would sink Western economies. As it is, the rising cost of oil is hollowing out the U.S. economy, and no fuel economy standards or new oil discovery will stop this tide. What is needed is a new energy paradigm.

#### E.U. and China already triggered speculator crisis.

Robert Bowen, 9-3-2012, Staff Writer, Examiner, “Oil prices drop as U.S. oil production reaches 15-year high,” http://www.examiner.com/article/oil-prices-drop-as-u-s-oil-production-reaches-15-year-high

One reason given for the drop in oil prices, besides increased output, is fears about the economy in Europe and China. Speculators do not want to buy high, and then if demand falls off later, they have to sell at a loss. If gasoline prices fall, then consumer spending will increase. That will lead to more jobs. That will boost the economy. It also helps the economy in the homes of average Americans.

#### Nuclear energy doesn’t directly trade-off with oil.

Ferenc L. Toth, 2006, senior energy economist with the Planning and Economic Studies Section in the Department of Nuclear Energy at IAEA, Hans-Holger Rogner, head of Planning and Economic Studies at IAEA, “Oil and nuclear power: Past, present, and future,” IAEA, <http://www.iaea.org/OurWork/ST/NE/Pess/assets/oil+np_toth+rogner0106.pdf>

The current relationship between nuclear power and oil has become distinctly different than it was a few decades ago. At the onset of the 21st century, nuclear and oil for electricity generation are targeting different electricity market segments with little overlap in the longer run. Oil for electricity generation in most industrialized countries serves, where not barred for environmental reasons, more the function of the disposal of residual oil for which no other applications can be found. However, advanced refineries converting larger portions of the barrel into premium products and stringent environmental regulation constrain the use of residual oil for power generation. Other uses of oil products include peak supply, back-up fuel, and dispersed non-grid generation. These markets have been relative captive for oil but this may change in the future with the advent of fuel cells. Since nuclear power has no role to play in these captive markets, growth prospects for oil are unaffected by a nuclear presence in the electricity generating market.

#### Even if you scale up IFRs there are no indirect effects.

Ferenc L. Toth, 2006, senior energy economist with the Planning and Economic Studies Section in the Department of Nuclear Energy at IAEA, Hans-Holger Rogner, head of Planning and Economic Studies at IAEA, “Oil and nuclear power: Past, present, and future,” IAEA, <http://www.iaea.org/OurWork/ST/NE/Pess/assets/oil+np_toth+rogner0106.pdf>

The second dimension of the oil–nuclear competition is indirect: nuclear electricity versus oil products at the level of end-use. It involves many factors including economics, productivity, convenience, regulation, availability, product quality, and social preferences. These factors limit the room for competition between electricity and oil products (and vice versa) in the residential, commercial, industrial, feedstock and transportation markets. Here the characteristics of fuels and associated conversion technologies can be an advantage or disadvantage in meeting a particular energy service demand. As we have witnessed over recent decades, transportation services have remained the domain of oil products despite many government policies targeted at the introduction of non-oil based transportation fuels including electric cars. Likewise, many energy services are exclusively a domain of electricity (information/communication, lighting, control, etc.) where oil products are essentially excluded. Electricity is an end-use energy technology without any emissions, highly efficient, versatile, and convenient to use. No wonder then that it has been the fastest growing end-use energy carrier worldwide. Oil use outside the transportation and chemical sectors (feedstock) and non-energy use has declined in the residential, commercial, and industrial sectors of the OECD countries (1973: 707 Mtoe; 2002: 403 Mtoe) in large part as a result of increased use of electricity and natural gas. In developing countries, oil use in these sectors has been increasing from 124 Mtoe to 354 Mtoe over the 1973–2002 period (IEA, 2004). Globally, however, oil use in these sectors has declined from 960 Mtoe to 811 Mtoe over this period.

### 2AC tax credit CP

#### Loans are ley to nuclear power development - externalities.

Mark Muro, 9-27-2011, a senior fellow and director of policy for the Metropolitan Policy Program at Brookings, manages the program's public policy analysis and leads key policy research projects, Brookings Institute, “Why the U.S. Should Not Abandon Its Clean Energy Lending Programs,” <http://www.brookings.edu/blogs/the-avenue/posts/2011/09/27-solyndra-muro-rothwell>

A loan guarantee is distinct from free money via a grant or a tax credit. A guarantee results in actual spending only if the borrower goes into default, at which point, the attorney general is obligated to recover the unpaid principal and interest by seizing the borrower’s assets. In the clean energy case, the $38.6 billion in DOE direct loans and loan guarantees is spread across three different programs, all of which are dedicated to supporting technologies that reduce environmental harm or conserve energy. The first two programs were signed into law by President Bush, but only one—the Advanced Technologies Vehicle Manufacturing program—has actually closed lending deals. This program is projected to return $700 million to the taxpayers next year through payments from auto-sector loan recipients. Overall, its long-run costs are projected to be $4.2 billion for supporting $16.2 billion of loans (or $4 in loans for every $1 of investment) and probably thousands of jobs in the auto sector during the recession. That’s not a bad rate of return. The third alternative energy loan program, the 1705 loan guarantee program, is the one responsible for the present furor because it guaranteed loan to Solnydra. After reductions to the program, it was appropriated $2.5 billion, the amount the Office of Management and Budget (OMB) predicts the program will eventually cost taxpayers once the all the spending authority is used up (loans are allowed to have a maturity of 30 years). That cost projection assumes 12.85 percent of the loan value given out will end in default. So Solyndra’s guarantee, which represented 2.8 percent of the 1705 portfolio, leaves considerable room for further defaults without losses exceeding budget costs, even if the government recovered nothing. But that is highly improbable. The federal government owns the assets of borrowers that default and can manage or sell them. OMB expects the program to recover almost half of its losses in such cases. Solyndra’s assets are reportedly worth $859 million, so it’s conceivable that taxpayers will not lose any money. For as much as $2.5 billion spent over decades and almost nothing spent as of today, the guarantee program generated $18.8 billion in loans and created thousands of jobs during a major recession. Most of those jobs have been construction related—building both factories and generation facilities—at a time when those workers are disproportionately unemployed. Many others are manufacturing jobs. The DOE appears to have only counted “permanent” jobs as those working for the borrower, but its loan guarantees stimulated additional spending across the U.S. supply chain in the rapidly-growing clean energy sector. Xyratex, for example, is a U.S. company that built the advanced machines for Solyndra’s factory. Its website lists dozens of job openings across the United States. The bottom line: The loan programs have been solid initiatives that have created jobs in a recession, generated $4 to $8 of private lending for every $1 of public investment, begun to scale up important clean energy technologies, and begun the work of financing the long-term restructuring of the U.S. economy. There is a broader justification for programs like the DOE’s Loan Guarantee Program. These programs are a proven, targeted, low-cost way of addressing critical market failures—like externalities from pollution, asymmetric information—through the use of market-oriented financial tools. Consider this: The U.S. government runs some 70 loan guarantee programs and 63 lending programs that catalyze the financing of everything from transportation infrastructure and rural housing to science parks. More than $3 trillion of taxpayer money is at risk in these programs—$3 trillion some might deem a scandalous form of government intrusion into markets for education, housing, agriculture, exports, and entrepreneurship. Yet it’s hard to find evidence the guarantees waste taxpayer dollars. Indeed, OMB estimates that, on balance, these programs will return $46 billion to taxpayers in 2011.As to the future, one thing is sure: the nation should not walk away from the promise of loan guarantees like the DOE’s. If anything, we should expand their use and complement them with other deployment finance mechanisms. The United States is failing to capture anything close to the full value of its many clean energy inventions many of which tend to be scaled up and manufactured abroad. So the choice is stark in the wake of Solyndra’s bankruptcy. State-directed capitalism a la China is neither effective in the long-run nor desirable at any point, but laissez-faire only guarantees market failure.

#### Consistent guarantees are needed to construct IFRs – historic bureaucratic changes show it spooks investors.

Charles Ferguson, November 2011, is the Philip D. Reed senior fellow for science and technology at the Council on Foreign Relations (CFR), is also an adjunct professor in the security studies program at Georgetown University, where he teaches a graduate-level course titled “Nuclear Technologies and Security,” and an adjunct lecturer in the national security studies program at the Johns Hopkins University, where he teaches a graduate level course titled “Weapons of Mass Destruction Technologies,” served as the project director for the CFR-sponsored Independent Task Force on U.S. Nuclear Weapons Policy, scientist-inresidence at the Monterey Institute’s Center for Nonproliferation Studies (CNS), won the Robert S. Landauer Lecture Award from the Health Physics Society, Foreign Policy, Issue 189, “JAPAN MELTED DOWN. BUT THAT DOESN'T MEAN THE END OF THE ATOMIC AGE,” Ebsco Host

IN FACT, NUCLEAR POWER plants are relatively cheap to operate. Averaging the costs over the life of the operation, a safely run plant can even be a cash cow, generating power at as low as 6 cents per kilowatt-hour, comparable to a coal-fired power plant. The problem is getting them built. A large reactor can cost several billion dollars, and construction delays -- as well as slowdowns forced by inevitable legal challenges -- have been known to drive up construction costs by $1 million a day. This problem is nothing new; it has plagued the industry since the 1970s. Years before the Three Mile Island disaster turned public opinion against the atom, the U.S. nuclear sector was already in trouble on account of legal and bureaucratic changes enacted under Presidents Richard Nixon, Gerald Ford, and Jimmy Carter that made new plants easier to stop with lawsuits -- usually filed by environmental and citizens' groups -- and regulations more unpredictable. That spooked investors, who in turn raised interest rates on borrowing for plant developers. The then-ongoing recession, which depressed energy demand, didn't help; neither did the plummeting price of oil and deregulation of natural gas that followed in the 1980s. Today, the industry argues that plant construction can only happen with the help of tens of billions of dollars in federal loan guarantees, which transfer financial risks onto taxpayers.

#### Loan guarantees are more important than the production tax credit or risk insurance.

George Voinovich, March 2008, U.S. Senator, Nuclear News, “Making the nuclear renaissance a reality,” Lexis Nexis

The nuclear industry's major financing challenge is the cost of new baseload nuclear power plants relative to the size of the companies that must make those investments. Unregulated generating companies and regulated integrated utilities represent different business models, and those differences influence how these companies approach nuclear plant financing. Regulated companies expect to finance nuclear plants in the same way they finance all major capital projects, with state regulatory approval and reasonable assurance of investment recovery through approved rate charges. These companies must know--before construction begins--that their investment in a new nuclear plant is judged prudent and can be recovered. Unregulated companies rely on debt financing with a highly leveraged capital structure. Since the estimated cost of a new nuclear plant ($5 billion to $6 billion) is a significant fraction of the company's assets, it is in effect a bet-the-company decision. To help overcome these obstacles, the Energy Policy Act of 2005 provides key incentives for investments in new nuclear plants: a production tax credit of $18 per megawatt-hour for the first 6000 megawatts of new nuclear capacity; regulatory risk insurance against delays in commercial operation caused by licensing or litigation for up to $500 million for the first two plants and $250 million for the next four; and loan guarantees up to 80 percent of the cost of projects, such as nuclear plants, that reduce emissions. While the production tax credit certainly improves the financial attractiveness of a project during its commercial operation, and regulatory risk insurance provides a safety net in case of regulatory delays, it is the loan guarantee provision that makes the difference for unregulated companies in deciding whether or not to build. Properly implemented, this loan guarantee program allows unregulated companies building nuclear plants to employ a more leveraged capital structure at reduced financing costs, which then benefits consumers through lower rates for the price of electricity.

#### No escalation – its all just rhetoric

Charles Boehmer (political science professor at the University of Texas) 2007 Politics & Policy, 35:4, “The Effects of Economic Crisis, Domestic Discord, and State Efficacy on the Decision to Initiate Interstate Conflict”

The theory presented earlier predicts that lower rates of growth suppress participation in foreign conflicts, particularly concerning conflict initiation and escalation to combat. To sustain combat, states need to be militarily prepared and not open up a second front when they are already fighting, or may fear, domestic opposition. A good example would be when the various Afghani resistance fighters expelled the Soviet Union from their territory, but the Taliban crumbled when it had to face the combined forces of the United States and Northern Alliance insurrection. Yet the coefficient for GDP growth and MID initiations was negative but insignificant. However, considering that there are many reasons why states fight, the logic presented earlier should hold especially in regard to the risk of participating in more severe conflicts. Threats to use military force may be safe to make and may be made with both external and internal actors in mind, but in the end may remain mere cheap talk that does not risk escalation if there is a chance to back down. Chiozza and Goemans (2004b) found that secure leaders were more likely to become involved in war than insecure leaders, supporting the theory and evidence presented here. We should find that leaders who face domestic opposition and a poorly performing economy shy away from situations that could escalate to combat if doing so would compromise their ability to retain power.

#### Domestic opposition outweighs – support for military adventures

Daniel Deudney, Hewlett Fellow in Science, Technology, and Society at the Center for Energy and Environmental Studies @ Princeton University, Bulletin of Atomic Scientists, Environment and Security: Muddled and Thinking April 1991, proquest

In addition, economic decline does not necessarily produce conflict. How societies respond to economic decline may largely depend upon the rate at which such declines occur. And as people get poorer, they may become less willing to spend scarce resources for military forces. As Bernard Brodie observed about the modern era, “The predisposing factors to military aggression are full bellies, not empty ones.” The experience of economic depressions over the last two centuries may be irrelevant, because such depressions were characterized by under-utilized production capacity and falling resource prices. In the 1930s, increased military spending stimulated economies, but if economic growth is retarded by environmental constraints, military spending will exacerbate the problem.

### 2AC Hagel

#### Diplomacy outweighs – both sides want peace

Stratfor March 8, 2012 “Signs of U.S.-Iranian Truce” http://www.stratfor.com/analysis/signs-us-iranian-truce

By continuing to advocate a diplomatic approach, Obama has risked the domestic political fallout of being seen as soft on Iran. However, his carefully phrased message appears to have made an impression on the Iranian leadership at a crucial geopolitical juncture. Over the past week, there has been a great deal of bluster in the international media over a potential military strike against Iran. The most common narrative has portrayed Israel as having no choice but to strike Iran imminently and independently if the United States continues to stall while Iran comes dangerously close to achieving nuclear weapons capability. This narrative has resonated with the audience of the American Israel Public Affairs Committee, the ardently pro-Israel lobby that hosted Israeli Prime Minister Benjamin Netanyahu at its annual conference this past week, and opposition contenders in the U.S. presidential race have frequently used it to condemn the Obama administration's foreign policy toward Iran. Despite the political pressures he was facing at home over the question of U.S. support for Israel against Iran, Obama was exceedingly cautious in responding to the war rhetoric. While maintaining that the military option remained viable, he said in a March 4 speech that "now is not the time for bluster," and that "loose talk of war" only works to Iran's advantage by driving up oil prices, providing it with more revenue to develop its nuclear program. Indeed, Khamenei has even recently articulated that the strength of Iran's foreign policy is that it has to do very little to disturb the oil markets and can rely simply on "threats against threats" to maintain its advantage over its adversaries. Obama also reiterated that more time is needed to allow pressure to sink in from the sanctions effort, and he stressed that a diplomatic path is the most appropriate way forward. The two leaders' recent speeches come after a quiet U.S. attempt to restart backchannel negotiations with Iran in early January with a letter from Obama requesting direct talks with Tehran. Shortly thereafter, the United States announced it would delay joint military exercises with Israel, and Iran, in turn, indefinitely postponed exercises in the Strait of Hormuz. Khamenei's positive reaction to Obama's statements over the past week represents another likely indicator that Iran is interested in negotiating with the United States. The supreme leader's statements come as Iran prepares to re-enter negotiations over its nuclear program with the P-5+1 group in Turkey in April. Neither side appears ready for a strategic accommodation, but as Iran tries to regain room to maneuver from sanctions and Obama tries to lower military tensions as he seeks re-election, there are signs of a fragile truce.

#### Nothing the president does will sway the Hagel nomination – math doesn’t add up

Ed Morrisey, “NBC: Hagel might lose 10 Democrats in the Senate,” Hot Air, January 7, 2013, http://hotair.com/archives/2013/01/07/nbc-hagel-might-lose-10-democrats-in-the-senate/.

Let’s take that as a baseline. That presumes that Obama has 43 votes from his own party on Hagel in the bag — hardly a rousing level of support for a Cabinet appointment, especially one as critical as Defense. Hagel would need eight votes from the GOP, a caucus which isn’t going to be inclined to ride to Obama’s rescue anyway, and certainly not for Hagel. Perhaps the White House thinks it has a better whip count than Chuck Todd, but Todd’s certainly correct that Democrats aren’t going out of their way to show any support for Hagel.

#### No momentum now – political conversation concludes no confirmation – prior nominations prove democratic support/unity is impossible – prefer evidence NOT from Obama’s own officials

Washington Post, “President Obama picks a confirmation fight. Can he win it?,” January 7, 2013,

In conversations with a handful of current and former Senate aides — of both parties — over the weekend, there was almost uniform agreement that Hagel faces a rocky road to confirmation although none were willing to predict that he won’t make the finish line.¶ The focus at the moment is on the Republican opposition to Hagel, opposition built around not simply his policy stances on Iran and Iraq, but also on his decision to, in their eyes, abandon the GOP once he left office.¶ “He basically doesn’t have a single Senate Republican friend who served with him,” said one senior GOP Senate aide granted anonymity to speak candidly. The source added that Hagel had not only given cover to Democrats on a number of high-profile issues but that he had also badly alienated his colleagues with his strong endorsement of former Democratic Sen. Bob Kerrey in the 2012 Nebraska Senate race. ¶ “Some Senate Republicans are still livid at his support for Bob Kerrey,” acknowledged a senior Democratic with long ties to the Senate. “I think that’s the real rub.”¶ While the Republican opposition to Hagel has drawn most of the headlines to date, however, the real danger to Obama’s pick to lead the Pentagon is from within the President’s own party. Past failed nominees — both for Cabinet posts and Supreme Court — have largely been done in not by the political opposition but rather by their own side. (See Miers, Harriet.)¶ And, while Hagel seemed to extinguish — or at least mitigate — a controversy over past comments about openly gay Ambassador James Hormel by issuing a full apology, his statements on Israel remain a major concern for Democrats, according to one veteran party aide in the Senate.

#### The plan would be a political motivator for nuclear power development – solves the waste issue.

Barry Brook & Tom Blees, 10-23-2012, a leading environmental scientist, holding the Sir Hubert Wilkins Chair of Climate Change at the School of Earth and Environmental Sciences, and is also Director of Climate Science at the University of Adelaide’s Environment Institute, published three books, over 200 refereed scientific papers, is a highly cited researcher, received a number of distinguished awards for his research excellence including the Australian Academy of Science Fenner Medal, is an International Award Committee member for the Global Energy Prize, Australian Research Council Future Fellow, ISI Researcher, Ph.D., Macquarie University in Environmental Engineering, Science Council for Global Initiatives, Edgeworth David Medal Royal Society of NSW, Cosmos Bright Sparks Award, Tom Blees is the author of Prescription for the Planet, the president of the Science Council for Global Initiatives, member of the selection committee for the Global Energy Prize, BraveNewClimate, “The Case for Near-term Commercial Demonstration of the Integral Fast Reactor,” <http://bravenewclimate.com/2012/10/23/the-case-for-near-term-commercial-demonstration-of-the-integral-fast-reactor/>

Light-water reactors (LWR) of any stripe, however, produce only a tiny fraction of the potential energy in uranium, less than 1%. Fast reactors, in contrast, unlock nearly all of it. The IFR, with its metal-fuel system and pyroprocessing, is able to utilize the actinides to such an extent as to essentially solve the waste problem by reducing the radiological toxicity of the waste products from hundreds of thousands of years to a mere few hundred years. Even if the “million-year problem” of LWR spent fuel is more a political than a technical challenge (given the small volume of the waste stream), nevertheless the issue of public perception of that issue is the one that guides nuclear policy in many countries [14]. As such, the transition to fast reactors and a closed nuclear fuel cycle is both a technical advancement and a political enabler for nuclear power of all kinds.

#### Loan guarantees specifically for nuclear is popular with congress – lower tax liability.

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The single most important spur to build new reactors in the United States is loan guarantees. In fact, industry sources indicate they are so critical that new plants may not be built without them. These guarantees are attractive to the US Congress because they offer a way to influence markets and incentivize specific projects, and because they are “scored” as a lower liability for the taxpayer than the actual amount. Thus, a potential US$50 billion in loan guarantees could be scored by the Congressional Budget Office as only costing the taxpayer US$500 million. As originally proposed in the Energy Policy Act (EPACT) of 2005, loan guarantees would only have applied to nuclear power, but this was broadened to apply to a wide range of “innovative energy technologies,” including renewable energy technologies, which further extends their attractiveness within Congress

#### Political capital theory not true.

Lawrence Jacobs & Desmond King, 2010, University of Minnesota, Nuffield College, “Varieties of Obamaism: Structure, Agency, and the Obama Presidency,” Perspectives on Politics

But personality is not a solid foundation for a persuasive explanation of presidential impact and the shortfalls or accomplishments of Obama's presidency. Modern presidents have brought divergent individual traits to their jobs and yet they have routinely failed to enact much of their agendas. Preeminent policy goals of Bill Clinton (health reform) and George W. Bush (Social Security privatization) met the same fate, though these presidents' personalities vary widely. And presidents like Jimmy Carter—whose personality traits have been criticized as ill-suited for effective leadership—enjoyed comparable or stronger success in Congress than presidents lauded for their personal knack for leadership—from Lyndon Johnson to Ronald Reagan.7 Indeed, a personalistic account provides little leverage for explaining the disparities in Obama's record—for example why he succeeded legislatively in restructuring health care and higher education, failed in other areas, and often accommodated stakeholders. Decades of rigorous research find that impersonal, structural forces offer the most compelling explanations for presidential impact.8 Quantitative research that compares legislative success and presidential personality finds no overall relationship.9 In his magisterial qualitative and historical study, Stephen Skowronek reveals that institutional dynamics and ideological commitments structure presidential choice and success in ways that trump the personal predilections of individual presidents.10 Findings point to the predominant influence on presidential legislative success of the ideological and partisan composition of Congress, entrenched interests, identities, and institutional design, and a constitutional order that invites multiple and competing lines of authority. The widespread presumption, then, that Obama's personal traits or leadership style account for the obstacles to his policy proposals is called into question by a generation of scholarship on the presidency. Indeed, the presumption is not simply problematic analytically, but practically as well. For the misdiagnosis of the source of presidential weakness may, paradoxically, induce failure by distracting the White House from strategies and tactics where presidents can make a difference. Following a meeting with Obama shortly after Brown's win, one Democratic senator lamented the White House's delusion that a presidential sales pitch will pass health reform—“Just declaring that he's still for it doesn't mean that it comes off life support.”11 Although Obama's re-engagement after the Brown victory did contribute to restarting reform, the senator's comment points to the importance of ideological and partisan coalitions in Congress, organizational combat, institutional roadblocks, and anticipated voter reactions. Presidential sales pitches go only so far.

#### Winners win.

David M. Green, 6-11-2010, professor of political science at Hofstra University, “The Do-Nothing 44th President”

Moreover, there is a continuously evolving and reciprocal relationship between presidential boldness and achievement. In the same way that nothing breeds success like success, nothing sets the president up for achieving his or her next goal better than succeeding dramatically on the last go around. This is absolutely a matter of perception, and you can see it best in the way that Congress and especially the Washington press corps fawn over bold and intimidating presidents like Reagan and George W. Bush. The political teams surrounding these presidents understood the psychology of power all too well. They knew that by simultaneously creating a steamroller effect and feigning a clubby atmosphere for Congress and the press, they could leave such hapless hangers-on with only one remaining way to pretend to preserve their dignities. By jumping on board the freight train, they could be given the illusion of being next to power, of being part of the winning team. And so, with virtually the sole exception of the now retired Helen Thomas, this is precisely what they did.

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#### War in Asia is unlikely – multiple reasons

Desker 2008 (Barry, Dean, S Rajaratnam School of International Studies, “Why War in Asia Remains Unlikely - Barry Desker,” International Institute for Strategic Studies, June 2-4, <http://www.iiss.org/conferences/global-strategic-challenges-as-played-out-in-asia/asias-strategic-challenges-in-search-of-a-common-agenda/conference-papers/fifth-session-conflict-in-asia/why-war-in-asia-remains-unlikely-barry-desker/> 11-12)

Nevertheless, the Asia-Pacific region is more stable than one might believe. Separatism remains a challenge but the break-up of states is unlikely. Terrorism is a nuisance but its impact is contained. The North Korean nuclear issue, while not fully resolved, is at least moving toward a conclusion with the likely denuclearization of the peninsula. Tensions between China and Taiwan, while always just beneath the surface, seem unlikely to erupt in open conflict (especially after the KMT victories in Taiwan). The region also possesses significant multilateral structures such as the Asia-Pacific Economic Cooperation (APEC) forum, the Shanghai Cooperation Organization (SCO), the nascent Six Party Talks forum and, in particular, ASEAN, and institutions such as the EAs, ASEAN + 3, ARF which ASEAN has conceived. Although the United States has been the hegemon in the Asia-Pacific since the end of World War II, it will probably not remain the dominant presence in the region over the next 25 years. A rising China will pose the critical foreign policy challenge, probably more difficult than the challenge posed by the Soviet Union during the Cold War. This development will lead to the most profound change in the strategic environment of the Asia-Pacific. On the other hand, the rise of China does not automatically mean that conflict is more likely. First, the emergence of a more assertive China does not mean a more aggressive China. Beijing appears content to press its claims peacefully (if forcefully), through existing avenues and institutions of international relations. Second, when we look more closely at the Chinese military buildup, we find that there may be less than some might have us believe, and that the Chinese war machine is not quite as threatening – as some might argue. Instead of Washington perspectives shaping Asia-Pacific affairs, the rise of China is likely to see a new paradigm in international affairs – the “Beijing Consensus” – founded on the leadership role of the authoritarian party state, a technocratic approach to governance, the significance of social rights and obligations, a reassertion of the principles of national sovereignty and non-interference, coupled with support for freer markets and stronger regional and international institutions. The emphasis is on good governance. Japan fits easily in this paradigm. Just as Western dominance in the past century led to Western ideas shaping international institutions and global values, Asian leaders and Asian thinkers will increasingly participate in and shape the global discourse, whether it is on the role of international institutions, the rules governing international trade or the doctrines which under-gird responses to humanitarian crises. An emerging Beijing Consensus is not premised on the rise of the ‘East’ and decline of the ‘West’, as sometimes seemed to be the sub-text of the earlier Asian values debate. I do not share the triumphalism of my friends Kishore Mahbubani and Tommy Koh. However, like the Asian values debate, this new debate reflects alternative philosophical traditions. The issue is the appropriate balance between the rights of the individual and those of the state. This debate will highlight the shared identity and shared values between China and the states in the region. I do not agree with those in the US who argue that Sino-US competition will result in “intense security competition with considerable potential for war” in which most of China’s neighbours “will join with the United States to contain China’s power.”[[1]](http://www.iiss.org/conferences/global-strategic-challenges-as-played-out-in-asia/asias-strategic-challenges-in-search-of-a-common-agenda/conference-papers/fifth-session-conflict-in-asia/why-war-in-asia-remains-unlikely-barry-desker/#_ftn1) These shared values are likely to reduce the risk of conflict and result in regional pressure for an accommodation with China and the adoption of policies of engagement with China, rather than confrontation with an emerging China. China is increasingly economically inter-dependent, part of a network of over-lapping cooperative regional institutions. In Asia, the focus is on economic growth and facilitating China’s integration into regional and global affairs. An interesting feature is that in China’s interactions with states in the region, China is beginning to be interested in issues of proper governance, the development of domestic institutions and the strengthening of regional institutional mechanisms. Chinese policy is not unchanging, even on the issue of sovereignty. For example, there has been an evolution in Chinese thinking on the question of freedom of passage through the Straits of Malacca and Singapore. While China supported the claims of the littoral states to sovereign control over the Straits when the Law of the Sea Convention was concluded in 1982, China’s increasing dependence on imported oil shipped through the Straits has led to a shift in favour of burden-sharing, the recognition of the rights of user states and the need for cooperation between littoral states and user states. Engagement as part of global and regional institutions has resulted in revisions to China’s earlier advocacy of strict non-intervention and non-interference. Recent Chinese support for global initiatives in peace-keeping, disaster relief, counter-terrorism, nuclear non-proliferation and anti-drug trafficking, its lack of resort to the use of its veto as a permanent member of the UN Security Council and its active role within the World Trade Organisation participation in global institutions can be influential in shaping perceptions of a rising China. Beijing has greatly lowered the tone and rhetoric of its strategic competition with the United States, actions which have gone a long way toward reassuring the countries of Southeast Asia of China’s sincerity in pursuing a non-confrontational foreign and security strategy. Beijing’s approach is significant as most Southeast Asian states prefer not to have to choose between alignment with the US and alignment with China and have adopted ‘hedging’ strategies in their relationships with the two powers. Beijing now adopts a more subtle approach towards the United States: not directly challenging US leadership in Asia, partnering with Washington where the two countries have shared interests, and, above all, promoting multilateral security processes that, in turn, constrain US power, influence and hegemony in the Asia-Pacific. The People’s Liberation Army (PLA) is certainly in the midst of perhaps the most ambitious upgrading of its combat capabilities since the early 1960s, and it is adding both quantitatively and qualitatively to its arsenal of military equipment. Its current national defence doctrine is centered on the ability to fight “Limited Local Wars”. PLA operations emphasize preemption, surprise, and shock value, given that the earliest stages of conflict may be crucial to the outcome of a war. The PLA has increasingly pursued the acquisition of weapons for asymmetric warfare. The PLA mimics the United States in terms of the ambition and scope of its transformational efforts – and therefore challenges the U.S. military at its own game. Nevertheless, we should note that China, despite a “deliberate and focused course of military modernization,” is still at least two decades behind the United States in terms of defence capabilities and technology. There is very little evidence that the Chinese military is engaged in an RMA-like overhaul of its organizational or institutional structures. While the Chinese military is certainly acquiring new and better equipment, its RMA-related activities are embryonic and equipment upgrades by themselves do not constitute an RMA. China’s current military buildup is still more indicative of a process of evolutionary, steady-state, and sustaining – rather than disruptive or revolutionary – innovation and change. In conclusion, war in the Asia-Pacific is unlikely but the emergence of East Asia, especially China, will require adjustments by the West, just as Asian societies have had to adjust to Western norms and values during the American century. The challenge for liberal democracies like the United States will be to embark on a course of self-restraint.

### Hagel

#### No miscalc – heated rhetoric benefits both – no actual conflict

Barbara Slavin (writer for Asia Times) January 6, 2012 “War of words aimed to avoid Iran conflict “ http://www.atimes.com/atimes/Middle\_East/NA06Ak01.html

The recent escalation in Iranian threats to blockade oil shipments and attack United States Navy vessels are meant to push up the price of oil and divert domestic opinion from an economic crisis, but are not likely to lead to a war in the Persian Gulf, in the view of Iran experts. Should Iran retaliate for impending new sanctions against its oil exports, it is more apt to target oil production in its neighbor, Iraq, than foreign tankers in the Gulf. "We've seen this movie before," Cliff Kupchan, an Iran analyst at the Eurasia Group, told Inter Press Service (IPS) on Wednesday, referring to Iran's defiant rhetoric and the firm US response. "Neither side wants a war. A lot of this rhetoric is overstated." While there is always a chance for miscalculation in the crowded waters of the Gulf, a clash of words is more useful to Tehran than actual hostilities. On Tuesday, after Iranian armed forces commander General Ataollah Salehi warned that a US aircraft carrier that left the Gulf last week should not return, the price of oil jumped 4%. The United States has also benefited from the tensions, recently concluding deals to sell Saudi Arabia $30 billion in advanced weaponry and $3.5 billion in arms to the United Arab Emirates. Despite threats last week to close the Strait of Hormuz, the choke point between Iran and Oman for much of the world's tanker-borne oil, Iran is not in a position to keep the waterway closed. During the 1980-88 Iran-Iraq war, Iran used mines and small boats to attack 190 ships from 31 nations, killing at least 63 sailors, according to David Crist, who wrote a history of naval encounters in the Gulf for The Washington Institute for Near East Policy in 2009. However, the US and allied navies kept the Gulf open for tanker traffic and Iran suffered significant losses, including three warships, two oil platforms and a number of boats. The US is now much better equipped to deal with the threat from Iranian mines, Crist wrote, with four counter-mine ships based in Bahrain and superior surveillance. While Iran now has more advanced anti-ship missiles and three Russian submarines, Kupchan dismissed Iranian naval power in the Gulf as "puny". Should Iran provoke a clash, Iran hawks in the US have suggested that the US military take the opportunity not just to hit Iranian naval assets, but to go after its nuclear installations as well. While the Barack Obama administration has given no indication that it would do so, Kupchan said Iran would be unlikely to jeopardize its "crown jewels".

#### Russia won’t intervene – chief of staff agrees

Xinhua, 4-20-2006, “Russia not to take sides in possible U.S. war against Iran: official”, People’s Daily Online, http://english.peopledaily.com.cn/200604/20/eng20060420\_259623.html

Russia will maintain neutrality in a possible armed conflict between Iran and the United States, Chief of General Staff of the Russian Armed Forces and First Deputy Defense Minister Yuri Baluyevsky said on Wednesday. "Unequivocally, and I'm saying it as chief of the General Staff, Russia will not be offering the use of its armed forces on either side," Baluyevsky was quoted by the Itar-Tass news agency as saying. He called for resolving the Iranian nuclear problems through negotiations. "A diplomatic solution of the Iranian nuclear problem is the only right path; one should walk on it, the nuclear problem should be resolved under strict control by the International Atomic Energy Agency," Baluyevsky said. According to Baluyevsky, a military solution of the Iranian problem will be "a big political and military error." "We are very well aware of the balance of forces between the United States and Iran, but I repeat -- a war is not the way one has to choose," Baluyevsky stated. He reminded about the statement made by the Iranian army chief of staff that "Iran does not plan to create the nuclear weapon, and the system of control over nonproliferation of weapons of mass destruction and missile technologies exists and demonstrates its effectiveness."