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#### Their Aff isn’t T:

#### Violates energy production - Demonstration reactors are distinct from power reactors used to produce electricity

Ingersoll 8, a senior program manager in Oak Ridge National Laboratory's Reactors and Nuclear Systems Division

<http://wiki.ornl.gov/sites/gnstd/gssec/meeting1/Shared%20Documents/2_4_Nuclear%20Reactors%20and%20Proliferation%20Risk.pdf>

 Reactors Come In Many Flavors

• Research Reactors

– To provide neutrons for basic and applied research

• Test Reactors

– To develop specific reactor technologies or explore operational characteristics

• Prototype or Demonstration Reactors

– To validate the overall performance of new reactor types

• Production Reactors

– To produce special nuclear materials for weapons

• Power Reactors

– To produce electricity

#### Violates incentives---they have to provide money to the private sector---R&D is distinct

CCES 9 Center for Climate and Energy Solutions (also called c2es) “Buildings and Emissions: Making the Connection” No specific date dated, most recent citation from 2009 www.c2es.org/technology/overview/buildings

Policy Options to Promote Climate-Friendly Buildings

The mosaic of current policies affecting the building sector is complex and dynamic involving voluntary and mandatory programs implemented at all levels of government, from local to federal. Government efforts to reduce the overall environmental impact of buildings have resulted in numerous innovative policies at the state and local levels. Non-governmental organizations, utilities, and other private actors also play a role in shaping GHG emissions from buildings through third-party “green building” certification, energy efficiency programs, and other efforts.

Various taxonomies have been used to describe the policy instruments that govern buildings, typically distinguishing between regulations, financial incentives, information and education, management of government energy use, and subsidies for research and development (R&D). Each of these is broadly described below.

-Standards and codes

Regulatory policies include building and zoning codes, appliance energy efficiency standards, clean energy portfolio standards, and electricity interconnection standards for distributed generation equipment. Building codes can require a minimum level of energy efficiency for new buildings, thus mandating reductions at the construction stage, where there is the most opportunity to integrate efficiency measures. Zoning codes can provide incentives to developers to achieve higher performance. Because of regional differences in such factors as climatic conditions and building practices, and because building and zoning codes are implemented by states and localities, the codes vary considerably across the country. While substantial progress has been made over the past decade, opportunities to strengthen code requirements and compliance remain.

Appliance and equipment standards require minimum efficiencies to be met by all regulated products sold; they thereby eliminate the least efficient products from the market. Federal standards exist for many residential and commercial appliances, and several states have implemented standards for appliances not covered by federal standards (see Appliance Efficiency Standards).

-Financial incentives

Financial incentives can best induce energy-efficient behavior where relatively few barriers limit information and decision-making opportunities (e.g., in owner-occupied buildings). Financial incentives include tax credits, rebates, low-interest loans, energy-efficient mortgages, and innovative financing, all of which address the barrier of first costs. Many utilities also offer individual incentive programs, because reducing demand, especially peak demand, can enhance the utility’s system-wide performance.

-Information and education

While many businesses and homeowners express interest in making energy-efficiency improvements for their own buildings and homes, they often do not know which products or services to ask for, who supplies them in their areas, or whether the energy savings realized will live up to claims. Requiring providers to furnish good information to consumers on the performance of appliances, equipment and even entire buildings is a powerful tool for promoting energy efficiency by enabling intelligent consumer choices.

-Lead-by-example programs

A variety of mechanisms are available to ensure that government agencies lead by example in the effort to build and manage more energy-efficient buildings and reduce GHG emissions. For example, several cities and states, and federal agencies (including the General Services Administration), have mandated LEED or LEED-equivalent certification for public buildings, and the Energy Independence and Security Act of 2007 includes provisions for reduced energy use and energy efficiency improvements in federal buildings.

-Research and development (R&D)

In the long run, the opportunities for a low-greenhouse gas energy future depend critically on new and emerging technologies. Some technological improvements are incremental and have a high probability of commercial introduction over the next decade (such as low-cost compact fluorescents). Other technology advances will require considerable R&D before they can become commercially feasible (such as solid-state lighting). The fragmented and highly competitive market structure of the building sector and the small size of most building companies discourage private R&D, on both individual components and the interactive performance of components in whole buildings.

Building Technologies Center. The Oak Ridge National Laboratory’s Buildings Technology Center was established by the U.S. Department of Energy (DOE) and performs research into issues including heating and cooling equipment, thermal engineering, weatherization, building design and performance, envelope systems and materials, and power systems.

Emerging Technologies. This U.S. DOE-sponsored program develops technology that would reduce energy use in residential and commercial buildings by 60-70 percent. Technologies are in fields including solid-state lighting, space conditioning and refrigeration, building envelopes, and analysis tools and design strategies that would facilitate the development of energy efficient buildings through software and computer-based building analysis.

#### Voting issue for limits and ground---creates an unmanageable topic of new speculative tech via government research that doesn’t interact with the market

**Dyson et al, 3** - International Union for Conservation of Nature and Natural Resources (Megan, Flow: The Essentials of Environmental Flows, p. 67-68)

Understanding of the term ‘incentives’ varies and economists have produced numerous typologies. A brief characterization of incentives is therefore warranted. First, the term is understood by economists as incorporating both positive and negative aspects, for example a tax that leads a consumer to give up an activity that is an incentive, not a disincentive or negative incentive. Second, although incentives are also construed purely in economic terms, incentives refer to more than just financial rewards and penalties. They are the “positive and negative changes in outcomes that individuals perceive as likely to result from particular actions taken within a set of rules in a particular physical and social context.”80 Third, it is possible to distinguish between direct and indirect incentives, with direct incentives referring to **financial** or other inducements and indirect incentives referring to both variable and **enabling incentives**.81 Finally, incentives of any kind may be called ‘perverse’ where they work against their purported aims or have significant adverse side effects. ¶ Direct incentives lead people, groups and organisations to take particular action or inaction. In the case of environmental flows these are the same as the net gains and losses that different stakeholders experience. The key challenge is to ensure that the incentives are consistent with the achievement of environmental flows. This implies the need to compensate those that incur additional costs by providing them with the appropriate payment or other compensation. Thus, farmers asked to give up irrigation water to which they have an established property or use right are likely to require a payment for ceding this right. The question, of course, is how to obtain the financing necessary to cover the costs of developing such transactions and the transaction itself. ¶ Variable incentives are policy instruments that affect the relative costs and benefits of different economic activities. As such, they can be manipulated to affect the behaviour of the producer or consumer. For example, a government subsidy on farm inputs will increase the relative profitability of agricultural products, hence probably increasing the demand for irrigation water. Variable incentives therefore have the ability to greatly increase or reduce the demand for out-of-stream, as well as in-stream, uses of water. The number of these incentives within the realm of economic and fiscal policy is practically **limitless.**

# SMR CP

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#### The United States Federal Government should substantially increase its commitment to support research and development for commercial adoption of non-gas cooled small modular nuclear reactors in coordination multilaterally with the Generation IV International Forum and bilaterally with any Generation IV International Forum member(s) who express particular interest in such efforts.

#### The United States Federal Government should cease all research and funding for the development of High Temperature Gas-Cooled Reactor energy production in the United States.

#### All their international cooperation advantages are based around joint R&D through Gen IV International Forum---light-water SMRs are a key technology for collaboration in the GIF---particularly because they’re built on assembly lines

NEI 11 – Nuclear Energy Institute, April 2011, “Small Reactors Provide Clean, Safe Power and Industrial Process Heat,” http://www.nei.org/resourcesandstats/documentlibrary/newplants/factsheet/small-modular-reactors-provide-clean-safe-power/

 Near-term construction of large, new nuclear plants will address two of our nation’s top priorities: additional supplies of clean energy and job creation. Small, modular reactors can complement these large-scale projects by expanding the level of deployment and application of carbon-free nuclear energy. Small-scale reactors provide energy companies and other users with a broader array of energy options.¶  Their small size—typically fewer than 300 megawatts (MW)1—and modular construction will allow these reactors to be built in a controlled factory setting and installed module by module, reducing the financing challenge and matching a variety of needs for low-carbon energy.¶  The potential applications for small reactors include electricity generation. Small reactors may be more compatible with the needs of smaller U.S. utilities from the standpoint of generation, transmission and financing than large 1,400-megawatt (MW) plants. In some cases, the industry envisions modular reactors built in clusters, with modules added as needed to match growth in energy demand.¶  Small, modular reactors could be used for industrial process heat applications, such as those used in the petrochemical industry, desalination or water purification. ¶  Another use for small reactors is providing power for the development of liquid transportation fuels from North American resources of oil sands, oil shale and coal-to-liquids applications, reducing the overall life-cycle carbon footprint of these activities.¶ Designs Target Diverse Applications¶ Many small, modular reactor designs are under development to meet specific U.S. and international market needs, and they are attracting considerable attention from Congress and the news media.¶ The international community has been evaluating the feasibility of small reactor technologies for the past several years through the Generation IV International Forum.2 The forum has identified six technologies for development.¶ In addition to small light-water reactors, the U.S. Department of Energy is focusing its efforts on two advanced reactor technologies: a high-temperature gas reactor (HTGR) and a sodium-cooled fast reactor (SFR). The Energy Policy Act of 2005 authorized research, development and construction of an HTGR. DOE is pursuing this design through its Next Generation Nuclear Plant project. The SFR technology is being studied as a method for managing high-level radioactive wastes.¶ Design activities are progressing in each of the three technologies. Each technology has unique development needs and a different timeline for reaching the market. Initial regulatory applications are expected within the few years for NRC design certifications and combined licenses for prototype reactors.¶ Light Water Reactors¶ Small light water reactors are designed to capitalize on the benefits of modular construction, ease of transportation and reduced financing, all of which could create a compelling business case. Since these designs typically are smaller than 300 megawatts electric, they could be used to replace older fossil-fired power stations of similar size that may no longer be economical to operate in a carbon-constrained world. The infrastructure, cooling water, rail and transmission facilities already exist at such facilities. Designs under development include:¶  Babcock & Wilcox Co. mPower Reactor. The mPower reactor design is a 125-megawatt (electric) advanced light water reactor design that uses natural phenomena such as gravity, convection and conduction to cool the reactor in an emergency with a below-ground containment.

#### Standardized factory-assembled reactors are the most effective tech for joint R&D---advanced reactors are too speculative and not replicable

William Magwood 4, was at time of testimony Director of the Office of Nuclear Energy, Science, and Technology, Department of Energy, 6/24/4, “NUCLEAR RESEARCH AND DEVELOPMENT AND THE IDAHO NATIONAL LABORATORY,” Federal News Service, p. lexis

REP. EHLERS: Now, I've heard over and over the biggest problem of the nuclear industry is that every new plant is an experiment and that what we need is a standardized product that people can put up with assurance that it's going to work and not do a lot of research on every new building. Are you envisioning that this will be -- you say it's a pilot. Would you envision this would be a model that other people would replicate?¶ MR. MAGWOOD: That's certainly -- that's the plan. The plan is that we would achieve a design, achieve a plan that could be replicated, not just in the United States but internationally, because one of the philosophies in the Generation IV International Forums is that nuclear be a competitive future. The market for a particular nuclear plant has to be as large as possible. And if you simply make a few plants here, make a few plants there, you're never cost- effective. You really have to be in position to having ongoing production to make it cost-effective, and we think that's what this can do and many of our international partners think this is very possible.¶ REP. EHLERS: Then you really have to use the KISS principle and keep it simple, stupid, so that it's easily replicated at a relatively low cost. Another question. Are you also, in your labs, investigating production of hydrogen using other high temperature means? And let me explain the reason for that. Hydrogen is not that easy to transport. It might make more sense to produce a lot of electricity and transport the electricity, then in metropolitan areas use that electricity in a high-temperature facility to produce the hydrogen. Are you investigating these possibilities as well, rather than just making the hydrogen at the facility?

## 2NC

#### SMRs are safer---passive cooling and automatic shutdown

Dillow 11 Clay, Popular Science, 3/17, "Can Next-Generation Reactors Power a Safe Nuclear Future?", www.popsci.com/technology/article/2011-03/beyond-fukushima-daiichi-can-better-reactors-provide-safe-nuclear-powered-future

Truly safe, secure nuclear power requires plants that simply cannot melt down, and that means going smaller rather than bigger. Podowski thinks one potential future relies on many smaller, distributed nuclear plants--so-called small modular reactors--that would contain a small amount of nuclear material, power a small area of the grid, and be protected by a smattering of passive mechanisms.¶ Because these reactors don’t concentrate too much heat in one place, no active cooling systems would be necessary to cool them--excess heat would be dispersed in the ambient air. By definition, Podowski says, these small reactors will be safer.¶ “The small reactors are inherently safe because nothing can happen at the small reactors,” Podowski says. “If something goes wrong they will be shut down automatically, the heat will be dispersed, and it will bring itself basically to a neutral state where there will be nothing coming in or out.”

#### Economies of multiples and Lego-style assembly create cheaper electricity with SMRs

Fairley 10 Peter, IEEE Spectrum, May, "Downsizing Nuclear Power Plants", spectrum.ieee.org/energy/nuclear/downsizing-nuclear-power-plants/0

A standard nuclear power plant generates a gigawatt or more of low-carbon power, a boon in this age of anxiety over climate change. The problem is getting the thing built in the first place: At US $7 billion to $10 billion apiece, nuclear plants are tough for even the largest utilities to finance.¶ President Obama proposes to handle the problem by tripling federal loan guarantees to such plants, to $54 billion. **But now a more economical solution** is coming under scrutiny: **downsizing nuclear plants** from gigawatt scale to more affordable units that can be built by the dozen. ”Size matters. In this case, small size,” says Andrew Kadak, a professor of nuclear science and engineering at MIT.¶ Small modular reactors, or SMRs, of 70 to 210 megawatts are under construction in China and Russia, and a mix of start-ups and established nuclear technology firms, such as Westinghouse Electric Co., General Atomics, and the Babcock & Wilcox Co., are shopping similarly modest designs in the United States.¶ This strategy overturns the drive toward economies of scale that has pushed nuclear designers toward ever-larger reactors since the industry’s inception. Now **the designers** may instead rely on the ”economies of multiples” that accrue to the mass production of everything from cars to iPhones.¶ ”We want to manufacture in a plant with supply-chain management. This enables you to drive down cost and control the schedule,” says John Parmentola, senior vice president for energy and electromagnetic systems at General Atomics. That means building modules, including reactors, that are small enough to be shipped on a truck or railcar and designed so that they can be snapped together on-site**. ”It’s almost Lego-style assembly**,” says Kadak.¶ These innovators hope to avoid the sprawling construction sites required to build today’s gigawatt-plus reactors, which are prone to quality problems and delays. For example, in 2005 France’s Areva boasted that its flagship 1.65-gigawatt pressurized water reactor, the EPR, would be completed by 2009. Now the company is admitting that faulty materials and planning snafus have set the completion target back to 2012 and raised the project’s estimated cost by 66 percent, to a budget of 5.3 billion ($7.2 billion).¶ Proponents of SMRs admit that their installation costs may turn out to be as much as or even more than that of today’s behemoths, but they argue that the lower risk involved should make SMRs the better deal anyway. Christofer Mowry, CEO of Babcock & Wilcox’s Modular Nuclear Energy subsidiary, leads the development of a 125-MW SMR called mPower that he estimates will cost about $600 million in parts and labor. That’s comparable to Areva’s Olkiluoto plant on a per-megawatt basis, but because mPower could be built in bite-size chunks with a relatively modest overhead investment, using the same reliable light-water reactor technology, it’s much more likely to work and to start working on schedule. That means the cost of financing and insuring the project should be much lower. ”**You could have 10 to 20 percent cheaper electricity,**” says Mowry.

#### No strain on NRC licensing/inspection due to SMRs

NEI 11 Nuclear Energy Institute, “Myths and Facts about Small Modular Reactors (SMRs)”, June 7 2011 is last date cited, www.nei.org/filefolder/MythsFacts.pdf

UCS statement: “The distributed deployment of small reactors would put great strains on licensing and inspection resources. Nuclear reactors are qualitatively different from other types of generating facilities, not least because they require a much more intensive safety and security inspection regime.”¶ The Facts: This is speculation that is not supported by any measure of NRC’s past and present resources. NRC has consistently been appropriated sufficient resources, and licensees then reimburse the agency for all licensing and inspection costs, so there is no factual evidence that deployment of SMRs would place any strain on NRC resources.

Squo solves their Plutonium distinction

Daniel Horner 10, Editor of Arms Control Today, May 2010, “Russia, U.S. Sign Plutonium Disposition Pact,” Arms Control Today, http://www.armscontrol.org/act/2010\_05/Plutonium

Russia and the United States last month signed an agreement clearing the way for Russia to turn dozens of tons of weapons-grade plutonium into reactor fuel. ¶ Secretary of State Hillary Rodham Clinton and Russian Foreign Minister Sergey Lavrov signed the accord in Washington April 13, during the nuclear security summit convened by President Barack Obama. ¶ The new agreement is a protocol to a 2000 pact, known as the Plutonium Management and Disposition Agreement (PMDA), that commits each side to the disposition of at least 34 metric tons of surplus weapons plutonium. The combined 68 metric tons of plutonium is “enough material for approximately 17,000 nuclear weapons,” the Department of State said in a document released in conjunction with the signing. ¶ Under the earlier version of the plan, Russia would have turned the plutonium into mixed-oxide (MOX) fuel—so called because it is a mix of plutonium and uranium oxides—for use in Russian light-water reactors (LWRs). That effort stalled over programmatic, financial, and legal differences. ¶ A main issue, as the State Department document put it, was that “the Russian program set forth in 2000 proved incompatible with Russia’s nuclear energy strategy and was, thus, not financially viable.” ¶ U.S. officials and others have long said that Russia never fully supported the plan for LWR disposition, preferring instead to use fast-neutron reactors. Russia and the United States eventually began renegotiating that aspect of the agreement and in November 2007 issued a joint statement outlining a plan for use of fast-neutron reactors by Russia. They said they planned to negotiate a protocol to change the PMDA accordingly. (See ACT, December 2007.) ¶ The Obama administration’s fiscal year 2011 budget request, which was released Feb. 1, said the two sides had “completed negotiations” on the protocol and expected to sign the new document “in early 2010.” (See ACT, March 2010.) ¶ The administration requested $113 million for fissile material disposition in Russia. In an April 21 interview, a U.S. official said “Congress made clear” that it wanted the protocol signed before it approved the funding request. ¶ The switch to fast-neutron reactors has drawn criticism from some nonproliferation specialists because such reactors, unlike LWRs, can produce more plutonium than they consume. The protocol includes “certain nonproliferation conditions,” as the State Department described them, that are designed to minimize the potential nonproliferation drawbacks of using fast-neutron reactors. ¶ Another significant change from the original PMDA is that the protocol caps total U.S. funding for the effort at the $400 million amount that the United States previously pledged. As the protocol notes, the funding is subject to U.S. congressional appropriations decisions. ¶ In his remarks at the signing ceremony, Lavrov said the Russian government would spend about $2.5 billion on the effort. ¶ Under the original plan, the United States had spearheaded a multinational effort to fund the Russian disposition effort. According to the protocol, Russia and the United States will “seek other donor funding that would be used to reduce Russian outlays,” but implementation of the program “will not be dependent” on contributions beyond the U.S. pledge. ¶ Spending, Nonproliferation Rules¶ The protocol specifies that “up to $300 million” of the $400 million can be spent on “development and construction activities.” That money can be spent “beginning as early as 2010 and continuing thereafter,” the document says. “Not less than $100 million” is to be spent after disposition actually begins; expenditures are to be “based on a fixed rate per metric ton” of disposition, according to the protocol. ¶ That funding is intended to serve as an “incentive,” the U.S. official said. The two sides have not yet determined the payment rate, he said. ¶ Under the protocol, the $300 million sum can be used for a wide variety of activities, including those “associated with the development, construction, and modification of facilities for fabricating MOX fuel and long-term storage of spent plutonium fuel” and “development of a system for monitoring and inspections.” ¶ The funding also can be used for certain types of work on the two fast-neutron reactors in which Russia would irradiate the MOX fuel—the BN-600, which is currently operating at the Beloyarsk site, and the larger BN-800, which is under construction at the same site. The protocol specifies that none of the U.S. funding shall be used for the construction of the BN-800, but the money can be used for “BN-800 core design.” ¶ U.S. negotiators made clear to their Russian counterparts that the U.S. government was “not in a position of helping [the Russians] build their own reactors,” but it would help them redesign the BN-800 core so that it has a breeding ratio of less than one, the U.S. official said. ¶ A breeding ratio of less than one means that the reactor is operating as a plutonium “burner,” consuming more plutonium than it produces, rather than as a breeder. ¶ The protocol continues the restriction from the original PMDA that spent fuel containing the weapons plutonium cannot be reprocessed until after the disposition mission is completed. However, unlike the original PMDA, the protocol does provide for some reprocessing of other materials that may be irradiated in reactors used for disposition. ¶ It says that “uranium assemblies that have been irradiated in the BN-600” can be reprocessed “if this does not result in the accumulation of new separated weapon-grade plutonium by itself or in combination with other materials.” The U.S. official said the provision was important to the Russians. The BN-600 will be operating with a partial MOX core, with only about one-quarter to one-third of the assemblies being MOX and the rest being uranium assemblies, he said. The Russians want to continue their current practice of reprocessing the uranium assemblies, he said, although the goal is to extract uranium rather than plutonium. The plutonium in this case is merely “an unfortunate byproduct,” the official said. ¶ Under another new provision, “up to thirty (30) percent of the assemblies with fuel containing plutonium prior to irradiation that have been irradiated in the BN-800” can be reprocessed if the reprocessing is “for purposes of implementing research and development programs for technologies for closing the nuclear fuel cycle” in Russia and the United States. However, the protocol specifies that the exception applies only if “such assemblies do not contain disposition plutonium and such reprocessing does not result in the accumulation of new separated weapon-grade plutonium by itself or in combination with other materials.” ¶ The U.S. official emphasized that it was not clear how vigorously Russia would pursue that option. The 30 percent figure is an “upper limit for sure,” he said. ¶ Reduced Disposition Rate¶ Under the protocol, each side “shall take all reasonable steps” to be able “to achieve a disposition rate of no less than 1.3 metric tons per year of disposition plutonium within as short a time as possible.” That figure represents a drop from the target disposition rate of 2 metric tons per year in the 2000 PMDA. The rate had to be reduced because the combined disposition capacity of the BN-600 and BN-800 is lower than that of the several LWRs that were to be used under the earlier agreement, the U.S. official said. ¶ In the U.S. disposition program, the Department of Energy and its National Nuclear Security Administration (NNSA) have had difficulty securing agreements with U.S. utilities to take the MOX fuel that is to be fabricated at a plant now being built by an NNSA contractor at the Energy Department’s Savannah River Site in South Carolina. However, that was not a factor in the reduced goal for the disposition rate, the official said. ¶ An NNSA press release at the time of the November 2007 preliminary agreement said the Russian reactors could dispose of “approximately 1.5 metric tons of Russian weapon plutonium per year.” That figure, the U.S. official said, was the “very best ballpark guesstimate,” and the new, slightly lower figure represents “technical refinements.”¶ The protocol adds that if ongoing work on a different kind of reactor, a gas-cooled high-temperature reactor, is successful, there could be “additional possibilities for increasing the disposition rate in the Russian Federation in 2019-2021.” Russia and the United States are cooperating on the development of that reactor.

#### SMRs are prolif resistant---closed fuel cycle and easy verification

Kuznetsov 8 Vladimir, International Atomic Energy Agency, December 20, "Options for small and medium sized reactors (SMRs) to overcome loss of economies of scale and incorporate increased proliferation resistance and energy security", Progress in Nuclear Energy Volume 50, Issues 2–6, March–August 2008, Pages 242–250, www.sciencedirect.com/science/article/pii/S0149197007001400

For many less developed countries, these are the features of enhanced proliferation resistance and increased robustness of barriers for sabotage protection that may ensure the progress of nuclear power.¶ All NPPs with innovative SMRs will provide for the implementation of the established safeguards verification procedures under the agreements of member states with the IAEA. In addition to this, **many innovative SMRs offer certain intrinsic proliferation resistance features to prevent the misuse, diversion or undeclared production of fissile materials and**/or **to facilitate the implementation of safeguards** (IAEA, 2006b).¶ For example, many of water-cooled SMRs employ low enrichment uranium and once-through fuel cycle as basic options. Therefore, the features contributing to proliferation resistance of such SMRs are essentially similar to that of presently operated PWRs and BWRs. They also include an unattractive isotopic composition of the plutonium in the discharged fuel, and radiation barriers provided by the spent fuel.¶ The intrinsic proliferation resistance features common to all HTGRs include high fuel burn-up (low residual inventory of plutonium, high content of 240Pu); a difficult to process fuel matrix; radiation barriers; and a low ratio of fissile to fuel-block/fuel-pebble mass. Although several HTGRs make a provision for reprocessing of the TRISO fuel, the corresponding technology has not been established yet and, until such time as when the technology becomes readily available, the lack of the technology is assumed to provide an enhanced proliferation resistance.¶ All liquid metal cooled SMRs are fast reactors that can ensure a self-sustainable operation on fissile materials or realize fuel breeding to feed other reactors present in nuclear energy systems. In both cases, and **if the fuel cycle is closed, the need of fuel enrichment and relevant uranium enrichment facilities would be eliminated**, which is a factor contributing to enhanced proliferation resistance.¶ Other features to enhance proliferation resistance of fast reactors are the following:¶ • No separation of plutonium and uranium at any fuel cycle stage and leaving a small (1–2% by weight) fraction of fission products permanently in the fuel;¶ • Denaturing of the fissile materials, e.g., through the optimization of the core design to achieve a higher content of 238Pu in the plutonium, to preclude the possibility of weapon production via securing an inadmissibly high level of residual heat of the plutonium fuel – the 238Pu/Pu ratio needed to achieve this still needs to be defined adequately.

#### A strong SMR industry’s key to US leadership, market share, and cradle to grave

Mandel 9 (Jenny – Scientific American, Environment & Energy Publishing, LLC, “Less Is More for Designers of "Right-Sized" Nuclear Reactors” September 9, 2009, http://www.scientificamerican.com/article.cfm?id=small-nuclear-power-plant-station-mini-reactor)

Tom Sanders, president of the American Nuclear Society and manager of Sandia National Laboratories' Global Nuclear Futures Initiative, has been stumping for small rectors for more than a decade. American-made small reactors, Sanders insists, can play a central role in global nonproliferation efforts. "Our role at Sandia is the national security-driven notion that it's in the interests of the U.S. to be one of the dominant nuclear suppliers," Sanders said. While U.S. companies have been exiting the industry over the past decades as government and popular support for new construction has waned, Sanders maintains that strong U.S. participation in the nuclear energy marketplace would give diplomats a new tool to use with would-be nuclear powers. "It's hard to tell Iran what to do if you don't have anything Iran wants," he explained. Sanders said mini-reactors are ideal to sell to developing countries that want to boost their manufacturing might and that would otherwise look to other countries for nuclear technologies. If the United States is not participating in that market, he said, it becomes hard to steer buyers away from technologies that pose greater proliferation risks. Sanders been promoting this view since the 1990s, he said, when he realized "we were no longer selling nuclear goods and services, so we could no longer write the rules." The domestic nuclear industry had basically shut down, with no new construction in decades and a flight of talent and ideas overseas. There is a silver lining in that brain drain, though, he believes, in that U.S. companies getting back into the game now are less tied to the traditional, giant plants and are freer to innovate. A feature that several of the new product designs share is that the power plants could be mass-produced in a factory to minimize cost, using robots to ensure consistency. Also, with less design work for each installation, the time to complete an order would be shortened and some of the capital and other costs associated with long lead times avoided, Sanders said. Another feature he favors is building the plants with a lifetime supply of fuel sealed inside. Shipped loaded with fuel, such reactors could power a small city for 20 years without the host country ever handling it. Once depleted, the entire plant would be packed back up and shipped back to the United States, he said, with the sensitive spent fuel still sealed away inside. Sanders is working on a reactor design hatched by the lab with an undisclosed private partner. He believes it is feasible to build a prototype modular reactor -- including demonstration factory components and a mockup of the reactor itself -- as early as 2014, for less than a billion dollars. A mini-reactor could ring up at less than $200 million, he said, or at $300 million to $400 million with 20 years of fuel. At $3,000 to $4,000 per kilowatt, he said, that would amount to significant savings over estimates of $4,000 to $6,000 per kilowatt for construction alone with traditional plant designs. To get a design ready to build, Sanders is urging a partnership between the government and the private sector. "If it's totally a government research program, labs can take 20 to 30 years" to finish such projects, he said. "If it becomes a research science project, it could go on forever." New approach, old debates So far, there is no sign that the government's nuclear gatekeeper, NRC, is wowed by the small-reactor designs. NRC's Office of New Reactors warned Babcock & Wilcox in June that the agency "will need to limit interactions with the designers of small power reactors to occasional meetings or other nonresource-intensive activities" over the next two years because of a crowded schedule of work on other proposals. Meanwhile, opponents of nuclear technologies are not convinced that small reactors are an improvement over traditional designs. Arjun Makhijani, who heads the Institute for Energy and Environmental Research, a think tank that advocates against nuclear power, sees disseminating the technology as incompatible with controlling it. "A lot of the proliferation issue is not linked to having or not having plutonium or highly enriched uranium, but who has the expertise to have or make bombs," Makhijani said. "In order to spread nuclear technologies, you have to have the people who have the expertise in nuclear engineering, who know about nuclear materials and chain reactions and things like that -- the same expertise for nuclear bombs. That doesn't suffice for you to make a bomb, but then if you clandestinely acquire the materials, then you can make a bomb." Peter Wilk, acting program director for safe energy with Physicians for Social Responsibility, an anti-nuclear group, argues that expanding nuclear power use runs counter to the goal of nonproliferation. "The whole proposition presupposes an ... international economy in which more and more fuel is produced and more and more waste must be dealt with, which only makes those problems that are still unsolved larger," he said. "It may or may not do a better job of preventing the host country from literally getting their hands on it, but it doesn't reduce the amount of fuel in the world or the amount of waste in the world," Wilk added. And then there is the issue of public opinion. "Imagine that Americans would agree to take the waste that is generated in other countries and deal with it here," Makhijani said. "At the present moment, it should be confined to the level of the fantastic, or even the surreal. If [the technology's backers] could come up with a plan for the waste, then we could talk about export." Makhijani pointed to a widely touted French process for recycling nuclear waste as a red herring (ClimateWire, May 18). "It's a mythology that it ameliorates the waste problem," he said. According to Makhijani's calculations, the French recycling process generates far more radioactive waste than it cleans up. One category of highly radioactive material, which ends up stored in glass "logs" for burial, is reduced, he said. But in processing the waste, about six times the original volume of waste is produced, he said. Much of that must be buried deep underground, and the discharge of contaminated wastewater used in recycling has angered neighboring countries, he said. Operational risk, of course, is another major concern. "One has reduced the amount of unnecessary risk," Wilke said, "but it's still unnecessary risk." He added, "I get the theory that smaller, newer, ought to be safer. The question is: Why pursue this when there are so many better alternatives?" To Sandia's Sanders, Wilke is asking the wrong question. With the governments of major economies like China, Russia and Japan putting support and cash into nuclear technologies, the power plants are here to stay, he believes. "There's going to be a thousand reactors built over the next 50 years," he said. "The question is: Are we building them, or are we just importing them?"

#### SMRs solve US nuclear leadership and prolif

Loudermilk 11—Research Associate for the Energy & Environmental Security Policy program with the Institute for National Strategic Studies at National Defense University (Micah, Small Nuclear Reactors and US Energy Security: Concepts, Capabilities, and Costs, www.ensec.org/index.php?option=com\_content&view=article&id=314:small-nuclear-reactors-and-us-energy-security-concepts-capabilities-and-costs&catid=116:content0411&Itemid=375)

Reactor safety itself notwithstanding, many argue that the scattering of small reactors around the world would invariably lead to increased proliferation problems as nuclear technology and know-how disseminates around the world. Lost in the argument is the fact that this stance assumes that US decisions on advancing nuclear technology color the world as a whole. In reality, regardless of the US commitment to or abandonment of nuclear energy technology, many countries (notably China) are blazing ahead with research and construction, with 55 plants currently under construction around the world—though Fukushima may cause a temporary lull. Since Three Mile Island, the US share of the global nuclear energy trade has declined precipitously as talent and technology begin to concentrate in countries more committed to nuclear power. On the small reactor front, more than 20 countries are examining the technology and the IAEA estimates that 40-100 small reactors will be in operation by 2030. Without US leadership, new nations seek to acquire nuclear technology turn to countries other than the US who may not share a deep commitment to reactor safety and nonproliferation objectives. Strong US leadership globally on nonproliferation requires a vibrant American nuclear industry. This will enable the US to set and enforce standards on nuclear agreements, spent fuel reprocessing, and developing reactor technologies. As to the small reactors themselves, the designs achieve a degree of proliferation-resistance unmatched by large reactors. Small enough to be fully buried underground in independent silos, the concrete surrounding the reactor vessels can be layered much thicker than the traditional domes that protect conventional reactors without collapsing. Coupled with these two levels of superior physical protection is the traditional security associated with reactors today. Most small reactors also are factory-sealed with a supply of fuel inside. Instead of refueling reactors onsite, SMRs are returned to the factory, intact, for removal of spent fuel and refueling. By closing off the fuel cycle, proliferation risks associated with the nuclear fuel running the reactors are mitigated and concerns over the widespread distribution of nuclear fuel allayed.

#### New proliferators will build small arsenals which are uniquely stable.

**Seng 98** (Jordan, PhD Candidate in Pol. Sci. – U. Chicago, Dissertation, “Strategy for Pandora's Children: Stable Nuclear Proliferation Among Minor States”, p. 203-206)

However, this "state of affairs" is not as dangerous as it might seem. The nuclear arsenals of limited nuclear proliferators will be small and, consequently, the command and control organizations that manage those arsenals will be small as well. The small arsenals of limited nuclear proliferators will mitigate against many of the dangers of the highly delegative, 'non-centralized' launch procedures Third World states are likely to use. This will happen in two main ways. First, only a small number of people need be involved in Third World command and control. The superpowers had tens of thousands of nuclear warheads and thousands of nuclear weapons personnel in a variety of deployments organized around numerous nuclear delivery platforms. A state that has, say, fifty nuclear weapons needs at most fifty launch operators and only a handful of group commanders. This has both quantitative and qualitative repercussions. Quantitatively, the very small number of people 'in the loop' **greatly diminishes the statistical probability** that accidents or human error will result in inappropriate nuclear launches. All else being equal, the chances of finding some guard asleep at some post increases with the number of guards and posts one has to cover. Qualitatively, small numbers makes it possible to centrally train operators, to screen and choose them with exceeding care, 7 and to keep each of them in direct contact with central authorities in times of crises. With very small control communities, there is no need for intermediary commanders. Important information and instructions can get out quickly and directly. Quality control of launch operators and operations is easier. In some part, at least, Third World states can compensate for their lack of sophisticated use-control technology with a more controlled selection of, and more extensive communication with, human operators. Secondly, and relatedly, Third World proliferators will not need to rely on cumbersome standard operating procedures to manage and launch their nuclear weapons. This is because the number of weapons will be so small, and also because the arsenals will be very simple in composition. Third World stares simply will not have that many weapons to keep track of. Third World states will not have the great variety of delivery platforms that the superpowers had (various ballistic missiles, cruise missiles, long range bombers, fighter bombers, missile submarines, nuclear armed ships, nuclear mortars, etc., etc.), or the great number and variety of basing options, and they will not employ the complicated strategies of international basing that the superpowers used. The small and simple arsenals of Third World proliferators will not require highly complex systems to coordinate nuclear activities. This creates two specific organizational advantages. One, small organizations, even if they do rely to some extent of standard operating procedures, can be flexible in times of crisis. As we have discussed, the essential problem of standard operating procedures in nuclear launch processes is that the full range if possible strategic developments cannot be predicted and specified before the fact, and thus responses to them cannot be standardized fully. An unexpected event can lead to 'mismatched' and inappropriate organizational reactions. In complex and extensive command and control organizations, standard operating procedures coordinate great numbers of people at numerous levels of command structure in a great multiplicity of places. If an unexpected event triggers operating procedures leading to what would be an inappropriate nuclear launch, it would be very difficult for central commanders to “get the word out' to everyone involved. The coordination needed to stop launch activity would be at least as complicated as the coordination needed to initiate it, and, depending on the speed of launch processes, there may be less time to accomplish it. However, the small numbers of people involved in nuclear launches and the simplicity of arsenals will make it far easier for Third World leaders to 'get the word out' and reverse launch procedures if necessary. Again, so few will be the numbers of weapons that all launch operators could be contacted directly by central leaders. The programmed triggers of standard operating procedures can be passed over in favor of unscripted, flexible responses based on a limited number of human-to-human communications and confirmations. Two, the smallness and simplicity of Third World command and control organizations will make it easier for leaders to keep track of everything that is going on at any given moment. One of the great dangers of complex organizational procedures is that once one organizational event is triggered—once an alarm is sounded and a programmed response is made—other branches of the organization are likely to be affected as well. This is what Charles Perrow refers to as interactive complexity, 8 and it has been a mainstay in organizational critiques of nuclear command and control s ystems.9 The more complex the organization is, the more likely these secondary effects are, and the less likely they are to be foreseen, noticed, and well-managed. So, for instance, an American commander that gives the order to scramble nuclear bombers over the U.S. as a defensive measure may find that he has unwittingly given the order to scramble bombers in Europe as well. A recall order to the American bombers may overlook the European theater, and nuclear misuse could result. However, when numbers of nuclear weapons can be measured in the dozens rather than the hundreds or thousands, and when deployment of those weapons does not involve multiple theaters and forward based delivery vehicles of numerous types, tight coupling is unlikely to cause unforeseen and unnoticeable organizational events. Other things being equal, it is just a lot easier to know all of what is going on. In short, while Third World states may not have the electronic use-control devices that help ensure that peripheral commanders do nor 'get out of control,' they have other advantages that make the challenge of centralized control easier than it was for the superpowers. The small numbers of personnel and organizational simplicity of launch bureaucracies means that even if a few more people have their fingers on the button than in the case of the superpowers, there will be less of a chance that weapons will be launched without a definite, informed and unambiguous decision to press that button.

#### ZERO risk of an impact—terrorists are a bunch of bumbling idiots

John Mueller and Mark G. Stewart 12, Senior Research Scientist at the Mershon Center for International Security Studies and Adjunct Professor in the Department of Political Science, both at Ohio State University, and Senior Fellow at the Cato Institute AND Australian Research Council Professorial Fellow and Professor and Director at the Centre for Infrastructure Performance and Reliability at the University of Newcastle, "The Terrorism Delusion," Summer, International Security, Vol. 37, No. 1, politicalscience.osu.edu/faculty/jmueller//absisfin.pdf

In 2009, the U.S. Department of Homeland Security (DHS) issued a lengthy report on protecting the homeland. Key to achieving such an objective should be a careful assessment of the character, capacities, and desires of potential terrorists targeting that homeland. Although the report contains a section dealing with what its authors call “the nature of the terrorist adversary,” the section devotes only two sentences to assessing that nature: “The number and high profile of international and domestic terrorist attacks and disrupted plots during the last two decades underscore the determination and persistence of terrorist organizations. Terrorists have proven to be relentless, patient, opportunistic, and flexible, learning from experience and modifying tactics and targets to exploit perceived vulnerabilities and avoid observed strengths.”8¶ This description may apply to some terrorists somewhere, including at least a few of those involved in the September 11 attacks. Yet, it scarcely describes the vast majority of those individuals picked up on terrorism charges in the United States since those attacks. The inability of the DHS to consider this fact even parenthetically in its fleeting discussion is not only amazing but perhaps delusional in its single-minded preoccupation with the extreme.¶ In sharp contrast, the authors of the case studies, with remarkably few exceptions, describe their subjects with such words as incompetent, ineffective, unintelligent, idiotic, ignorant, inadequate, unorganized, misguided, muddled, amateurish, dopey, unrealistic, moronic, irrational, and foolish.9 And in nearly all of the cases where an operative from the police or from the Federal Bureau of Investigation was at work (almost half of the total), the most appropriate descriptor would be “gullible.”¶ In all, as Shikha Dalmia has put it, would-be terrorists need to be “radicalized enough to die for their cause; Westernized enough to move around without raising red flags; ingenious enough to exploit loopholes in the security apparatus; meticulous enough to attend to the myriad logistical details that could torpedo the operation; self-sufficient enough to make all the preparations without enlisting outsiders who might give them away; disciplined enough to maintain complete secrecy; and—above all—psychologically tough enough to keep functioning at a high level without cracking in the face of their own impending death.”10 The case studies examined in this article certainly do not abound with people with such characteristics. ¶ In the eleven years since the September 11 attacks, no terrorist has been able to detonate even a primitive bomb in the United States, and except for the four explosions in the London transportation system in 2005, neither has any in the United Kingdom. Indeed, the only method by which Islamist terrorists have managed to kill anyone in the United States since September 11 has been with gunfire—inflicting a total of perhaps sixteen deaths over the period (cases 4, 26, 32).11 This limited capacity is impressive because, at one time, small-scale terrorists in the United States were quite successful in setting off bombs. Noting that the scale of the September 11 attacks has “tended to obliterate America’s memory of pre-9/11 terrorism,” Brian Jenkins reminds us (and we clearly do need reminding) that the 1970s witnessed sixty to seventy terrorist incidents, mostly bombings, on U.S. soil every year.12¶ The situation seems scarcely different in Europe and other Western locales. Michael Kenney, who has interviewed dozens of government officials and intelligence agents and analyzed court documents, has found that, in sharp contrast with the boilerplate characterizations favored by the DHS and with the imperatives listed by Dalmia, Islamist militants in those locations are operationally unsophisticated, short on know-how, prone to making mistakes, poor at planning, and limited in their capacity to learn.13 Another study documents the difficulties of network coordination that continually threaten the terrorists’ operational unity, trust, cohesion, and ability to act collectively.14¶ In addition, although some of the plotters in the cases targeting the United States harbored visions of toppling large buildings, destroying airports, setting off dirty bombs, or bringing down the Brooklyn Bridge (cases 2, 8, 12, 19, 23, 30, 42), all were nothing more than wild fantasies, far beyond the plotters’ capacities however much they may have been encouraged in some instances by FBI operatives. Indeed, in many of the cases, target selection is effectively a random process, lacking guile and careful planning. Often, it seems, targets have been chosen almost capriciously and simply for their convenience. For example, a would-be bomber targeted a mall in Rockford, Illinois, because it was nearby (case 21). Terrorist plotters in Los Angeles in 2005 drew up a list of targets that were all within a 20-mile radius of their shared apartment, some of which did not even exist (case 15). In Norway, a neo-Nazi terrorist on his way to bomb a synagogue took a tram going the wrong way and dynamited a mosque instead.15

# SK DA

#### US won’t cave on South Korea ENR now

Lee Byong Chul, senior fellow @ Inst. For Peace and Coop., 10-8-2012, “South Korea eschews enrichment of uranium,” Japan Times, http://www.japantimes.co.jp/text/eo20121008a4.html

South Korean officials have recently realized that the United States is likely to try to forbid them from enriching uranium and expanding their country's missile range, rather than leave these issues on the diplomatic back burner. Indeed, recent discreet talks, in which the U.S. has disregarded South Korean efforts to supplement the controversial U.S.-South Korea Nuclear Cooperation Agreement, which expires in March 2014, suggest that there are reasons to be deeply worried about the alliance's future. American negotiators — the reluctant midwives of South Korea's increasing responsibility in the field of atomic energy — remain steadfast in their opposition to South Korea's drive for improved defensive capabilities and a more advanced energy policy, despite the potential strategic benefits. U.S. nonproliferation experts do not anticipate progress on South Korea's efforts to win support for its preferred policies until the U.S. gains more leverage. Such a stalemate is not new. Nuclear talks between the two countries have often been characterized by poor communication and a lack of understanding. While South Korean officials rarely say in public what they really think, it is widely believed that U.S. policymakers have little motivation to reconcile with South Korea's government right now — they would prefer to stifle South Korea's increasingly loud demands. In the U.S.-South Korea relationship's heyday, American politicians considered the country an "extended arm of America." Such condescension may have been defensible when South Korea's military dictatorship needed America's political protection and security guarantee, but now the country is a beacon of democracy in East Asia. So, while South Koreans understand the need for compromise and cooperation, they believe that the time is right for a more balanced partnership. This belief does not imply South Korean cynicism about nonproliferation. Rather, it reflects concern about a nuclear North Korea, compounded by anxiety over the recent U.S.-Japan missile-defense accord. Given that the U.S. and South Korea have the same assessment of the intelligence regarding North Korea's nuclear progress, not to mention South Korea's vulnerability, their failure to reach a practical agreement is troubling. Former Deputy Foreign Minister Chun Yung Woo warned an American official in 2010 that revising the Nuclear Cooperation Agreement could soon become a "defining issue" in South Korea-U.S. relations, and that it was already attracting "significant amounts of negative press attention." Given South Korea's status as one of the world's top five nuclear-power producers, Chun argued, the South Korean public would not tolerate the perception that Japan was receiving preferential treatment. Indeed, rightwing leaders like Rep. Chung Mong Joon of the governing Saenuri Party have been vocal in expressing their doubts about South Korea's current denuclearization policy, suggesting that a nuclear weapons program could prevent a second war on the peninsula. The conservatives seem to believe that American nuclear protection for South Korea is a thing of the past. Despite their hawkish approach to North Korea's nuclear threats, South Korean officials know that uranium enrichment and spent-fuel reprocessing remains only a distant possibility. As a result, they are approaching negotiations skeptically, rather than emphasizing the sense of mutual obligation that should characterize the alliance. Their pessimism is hardly groundless, given that the United Arab Emirates has already signed a similar agreement with the U.S. declaring that it would not produce nuclear fuel. Indeed, South Korean negotiators appear convinced that they will not be able to make any headway with the U.S. on the issue. (To be sure, this failure may not matter much, given South Korean scientists' past declaration that they will not contribute to any nuclear program that could be used for military purposes.)

#### Failure to maintain a hardline on domestic reprocessing shatters the norm against ENR and makes credible US diplomatic pressure impossible – ensures South Korean ENR

Scott Sagan, poly sci prof @ Stanford, co-chair Global Nuclear Future Initiative, 4-18-2011, “The International Security Implications of U.S. Domestic Nuclear Power Decisions,” http://cybercemetery.unt.edu/archive/brc/20120621005012/http://brc.gov/sites/default/files/documents/sagan\_brc\_paper\_final.pdf

A similar phenomenon occurs when policy makers and scholars underestimate the international effect of the U.S. decision to abandon plutonium reprocessing in the 1970s. Skeptics claim that the fact that France and Japan, especially, went forward with their ambitious plutonium reprocessing efforts somehow demonstrates that U.S. efforts to constrain the global growth were a failure. But a more appropriate standard (but again more difficult to measure) for assessing our influence would estimate the number of states that would have developed plutonium reprocessing capabilities if the U.S. had not actively discouraged such fuel cycle activities after Jimmy Carter’s April 1997 order to cancel construction of commercial breeder reactors that employed a closed fuel cycle with plutonium reprocessing. The primary motivation behind the decision to postpone the development of this technology was a concern for the proliferation implications of the U.S. use of a closed fuel cycle. 17 The Carter administration reasoned that the decision to end reprocessing in the U.S. would have two effects: first, the U.S. could no longer act as an exporter of related technologies, limiting their availability; and second, it would create a normative change that would redefine the behavior of a responsible nuclear power state. Because we are estimating a counterfactual condition, it is not possible to measure definitively the effects of the Carter policy on the actual spread of reprocessing facilities around the world. Of the twenty-one countries that at some point in their history pursued plutonium reprocessing, ten have finished large-scale facilities and use them today: U.S., China, Israel, France, UK, India, Japan, Pakistan, Russia, and North Korea. 18 Algeria and the Czech Republic have a pilot-scale reprocessing plants, but have not moved towards further industrial development. 19 Nine countries abandoned their reprocessing programs: South Korea, Taiwan, Germany, Iraq, Italy, Argentina, Brazil, Belgium, and Yugoslavia. 20 The causes of these reversal decisions were complex, but in many of the cases U.S. diplomatic pressure was an important factor and that pressure was made more credible and acceptable because the U.S had given up its own civilian plutonium reprocessing programs. This “credibility” factor continues to be important today. South Korea is lobbying to renegotiate its agreements with the U.S. to be able to develop “pyro-processing,” a form of spent fuel reprocessing that supporters claim poses fewer proliferation risks than standard PUREX acqueous reprocessing. While this appears a challenge to the claim that the U.S. policy has had a positive influence, the very fact that the South Koreans are actively arguing that pyro-processing – unlike the PUREX process – does not separate out plutonium shows their awareness of the power of the norm against developing such technologies. While the U.S. government initially cooperated with South Korea on pyroprocessing research, Richard Stratford (Director of the Office of Nuclear Energy Affairs in the Bureau of Nonproliferation, U. S. Department of State) recently stated that the technology “moved to the point that the product is dangerous from a proliferation point of view,” and that the DOE now “states frankly and positively that pyro-processing is reprocessing.” The U.S. government position against pyro-processing in South Korea today is made more credible by the fact that the U.S. does not reprocess spend fuel for commercial purposes. 21

#### South Korean ENR causes South Korean prolif and undermines US nonprolif efforts with Iran, North Korea, and Southeast Asia

Zachary Keck 12, Assistant Editor of The Diplomat, “Rough Waters? The State of the ROK-U.S. Alliance,” The Diplomat, 8-22-12, http://thediplomat.com/flashpoints-blog/2012/08/22/rough-waters-the-state-of-the-rok-u-s-alliance/

Washington’s concerns over South Korean’s nuclear ambitions have only been heightened by Seoul’s latest campaign to acquire indigenous enrichment and reprocessing facilities, which it is proscribed from doing under a nuclear pact it signed with Washington in 1974. In contrast, the U.S. has signed agreements recognizing Japan’s reprocessing and enrichment rights as well as India’s de facto reprocessing capability. Now, with the U.S. and South Korea renegotiating the 1974 nuclear pact that will expire in 2014, South Korea has demanded that Washington acquiesce to Seoul building enrichment and processing facilities. South Korea’s immediate interest in acquiring these capabilities is not nuclear weapons but rather further expanding its nuclear energy industry at home and abroad. Nonetheless, the U.S. has rejected South Korea’s request thus far, with President Obama’s top proliferation adviser, Garry Samore, telling South Korean reporters last month, “There is no danger that Korean industry will not be able to get access to low enriched uranium," Washington has a number of reasons to oppose South Korea’s request, many of which have nothing to do with Seoul. For instance, a key component of President Obama’s nuclear security agenda is the goal of securing all nuclear materials worldwide within four years. Allowing South Korea to begin producing its own fissile materials would run counter to this goal and undercut the administration’s important successes in reducing the number of countries that possess and produce these materials. Allowing South Korea to build these facilities would also undermine the current U.S.-led campaign to persuade Iran to abandon its own enrichment facilities. It would also adversely affect a number of U.S. objectives in the Asia-Pacific, including persuading Pyongyang to surrender its own nuclear program, according Japan a heightened status among U.S. allies, and keeping Southeast Asia’s budding nuclear energy programs on their current peaceful trajectories. Under the surface, however, Washington’s opposition is likely due in part to its uncertainty over South Korea’s long-term nuclear intentions. As noted above, South Korea already has a history of covertly seeking nuclear arms. That this took place before Seoul became a democracy is cold comfort to the U.S given that South Koreans have at times been overwhelming in favor of their country acquiring nuclear weapons. In other words, at a time when the region is undergoing sweeping changes, the U.S. is increasingly less confident that South Korea will continue to rely on Washington for its security indefinitely. Indeed, there are already a number of signs that Seoul is seeking greater autonomy. These come at a time when the U.S. will need South Korea more than ever in order to properly rebalance its forces in the region.

#### New Asian prolif ensures widespread nuclear conflict --- asymmetries

Lyon 9 (December, Program Director, Strategy and International, with Australian Strategic Policy Institute, previously a Senior Lecturer in International Relations at the University of Queensland, “A delicate issue, Asia’s nuclear future”)

Deterrence relationships in Asia won’t look like East–West deterrence. They won’t be relationships of mutual assured destruction (MAD), and there will be many asymmetries among them. Regional nuclear-weapon states will articulate a spectrum of strategies ranging from existential deterrence to minimum deterrence to assured retaliation; and sometimes doctrinal statements will outrun capabilities. The smaller arsenals of Asia and the absence of severe confrontations will help to keep doctrines at the level of generalised deterrence. Extended nuclear deterrence will continue to be important to US allies in East Asia, although it is hard to imagine other Asian nuclear weapon states ‘extending’ deterrence to their clients or allies. Alagappa’s propositions contain a ‘picture’ of what a more proliferated Asia might look like. It could well remain a region where deterrence dominates, and where arsenals are typically constrained: an Asia, in fact, that falls some way short of a ‘nuclear chaos’ model of unrestrained proliferation and mushrooming nuclear dangers. An order in flux? Notwithstanding Alagappa’s more reassuring view, we shouldn’t understate the extent of the looming change from a nuclear relationship based on bipolar symmetry to a set of relationships based on multiplayer asymmetries. As one observer has noted, when you add to that change the relatively constrained size of nuclear arsenals in Asia, the likelihood of further nuclear reductions by the US and Russia, and ballistic missile defences of uncertain effectiveness, the world is about to enter uncharted territory (Ford 2009:125). Some factors certainly act as stabilising influences on the current nuclear order, not least that nuclear weapons (here as elsewhere) typically induce caution, that the regional great powers tend to get along reasonably well with each other and that the region enters its era of nuclear pre-eminence inheriting a strong set of robust norms and regimes from the earlier nuclear era. But other factors imply a period of looming change: geopolitical dynamism is rearranging strategic relationships; the number of risk-tolerant adversaries seems to be increasing; most nuclear weapons states are modernising their arsenals; the American arsenal is ageing; and the US’s position of primacy is increasingly contested in Asia. Indeed, it may be that dynamism which could most seriously undermine the Solingen model of East Asian nonproliferation. Solingen, after all, has not attempted to produce a general theory about proliferation; she has attempted to explain only proliferation in the post-NPT age (see Solingen 2007:3), when the P-5 of the UN Security Council already had nuclear weapons. In essence, though, it’s exactly that broader geopolitical order that might be shifting. It isn’t yet clear how the Asian nuclear order will evolve. It’s one of those uncertainties that define Australia’s shifting strategic environment. It’s not too hard to imagine an order that’s more competitive than the one we see now. The ‘managed system of deterrence’ The second approach to thinking about the Asian nuclear order is to attempt to superimpose upon it William Walker’s two key mechanisms of the first nuclear age: the ‘managed system of deterrence’ and the ‘managed system of abstinence’. What might those ‘systems’ look like in Asia? In Walker’s model, the managed system of deterrence included: the deployment of military hardware under increasingly sophisticated command and control; the development of strategic doctrines to ensure mutual vulnerability and restraint; and the establishment of arms control processes through which policy elites engaged in dialogue and negotiated binding agreements. (Walker 2007:436) It isn’t obvious that those core aspects of the ‘managed’ system are all central features of Asian nuclear relationships. Perhaps most importantly, it isn’t obvious that the world even has a good model for how deterrence works in asymmetric relationships. Within the US, there’s been something of a revival of interest in matters nuclear as strategic analysts attempt to reconceptualise how nuclear relationships might work in the future. Recent work on the problems of exercising deterrence across asymmetrical strategic contests, for example, suggests a number of problems: ‘In asymmetric conflict situations, deterrence may not only be unable to prevent violence but may also help foment it’ (Adler 2009:103). Some of the problems arise precisely because weaker players seem increasingly likely to ‘test’ stronger players’ threats—as part of a pattern of conflict that has emerged over recent centuries, in which weaker players have often prevailed against stronger opponents.3 If we were to look at the case study of the India–Pakistan nuclear relationship—which is grounded in an enduring strategic rivalry, and therefore not ‘typical’ of the broader nuclear relationships in Asia—it’s a moot point whether Pakistani behaviour has been much altered by the ‘deterrence’ policies of India. Indeed, the case seems to show that Pakistan doesn’t even accept a long-term condition of strategic asymmetry with India, and that it intends to use its nuclear weapons as an ‘equaliser’ against India’s larger conventional forces by building a nuclear arsenal larger than the Indian arsenal arrayed against it. That would imply, more broadly, that increasing strategic rivalries across Asia could be accompanied by efforts to minimise asymmetrical disadvantages between a much wider range of players. In short, in a more competitive Asian strategic environment, nuclear asymmetries that are tolerable now might well become less tolerable. Furthermore, we need to think about how we might ‘codify’ deterrence in Asia. In the Cold War days, the MAD doctrine tended to be reflected in arms control accords that limited wasteful spending and corralled the competition. As Walker acknowledges, the agreements were important ‘stabilisers’ of the broader nuclear relationship, but to what extent can they be replicated in conditions of asymmetry? It might be possible to codify crisis management procedures, but designing (and verifying) limitations on weapons numbers would seem to be much more difficult when the arsenals are of uneven size, and when the weaker party (perhaps both parties) would probably be relying on secrecy about the numbers and locations of weapons to minimise the vulnerability of their arsenals.

# Helium DA

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#### HTGRs cause massive spikes in helium demand

Mark Haynes 12, President, Concordia Power, 7/20/12, “Helium: Supply Shortages Impacting our Economy, National Defense and Manufacturing,” Congressional Documents and Publications, p. lexis

Mr. Chairman and Members of the Subcommittee, my name is Mark Haynes, I am President of Concordia Power, a small company that works with the NGNP Industry Alliance. The NGNP Industry Alliance is comprised of a number of major companies including Dow Chemical, ConocoPhilips, Entergy, AREVA, Westinghouse, SGL Group, Graftech, Mersen, Toyo Tanso, Ultra-Safe Nuclear, Technology Insights and the Petroleum Technology Alliance Canada.

Our Alliance’s purpose is to help ensure the commercialization of High Temperature Gas Cooled Reactors (HTGRs) as an extremely important energy option for the future. HTGRs, which are helium cooled, are unique in both their very high outlet temperatures and their intrinsic safety characteristics. Although these reactors will include multiple safety features, they will require no active or passive safety systems or operator intervention to ensure the safety of the public. Taken together, these characteristics make HTGRs not only very desirable electric power generators with extraordinarily high efficiency and safety, but they also allow HTGRs to be co-located with major industrial and extraction facilities where their high temperature output can substitute for the very large amounts of fossil fuels these facilities currently consume in the production of process heat.

In addition, HTGRs can also play an unmatched role in greatly improving the efficiency and environmental performance of converting coal or other indigenous carbon sources to liquid fuels with an extremely small carbon footprint. As explained in more detail later in this testimony, a relatively conservative estimate is that in North America, there is a market for 600 or more HTGR modules in this century. To the point of this hearing, the unique characteristics of helium are key to making this technology possible.

I believe it’s correct to say that our invitation to testify here today does not relate to any particular expertise we might have with regard to either the Federal Helium Reserve or the current helium markets. Rather, our presence here relates more to the fact that HTGRs are a unique and important example of an emerging energy technology that is very dependent on a reliable and affordable supply of helium in the future.

Why Helium is Important to HTGRs

Helium coolant is a key element of HTGR design. Helium has four characteristics that make it a superior reactor coolant:

- It is chemically inert in the HTGR process. Hence, during reactor operations, extraordinary event or interruption by natural cause (as a flood or earthquake) or a human error or equipment event that affects the plant normal operations, it does not corrode reactor internals nor does it contribute to the spread of significant amounts of radioactive particles around the plant or the environment;

- It is itself “invisible” to radiation: it does not become radioactive in the course of cooling the reactor core and the reactivity of the core is not impacted by its presence or non-presence. This second characteristic is an important added safety feature in the event of even its complete loss from the reactor core in an accident; and

- It is always in a gaseous phase at any temperature in the core. This ensures that in an extraordinary accident event there is no extreme pressure conditions created, such as can occur in a light water reactor where the flashing of coolant water into steam requires a very robust containment in the event of a loss of coolant.

- It is an efficient heat transport fluid. This allows a more economical design and efficient plant operation. It is also important to note that the other materials (graphite and ceramic coated fuel) are also non-corrosive and very chemically compatible with helium. This combination of materials is stable at extremely high temperatures. So, in a worst-case scenario loss of helium accident, the reactor core structure remains stable and the fuel stays well within its design limits. This is additional insurance that a Fukushima-type scenario cannot happen with an HTGR.

Helium Use and HTGRs

Although it is difficult to predict with precision how much helium will be required in the future for HTGRs, our Alliance, in concert with the Idaho National Laboratory estimates that in North America, there could be a future demand for several hundred 600 Megawatt thermal modules. This includes meeting needs in petrochemical production, refining, liquid fuel production, electric power generation and other markets.

Each reactor module in a fleet of HTGRs would require an initial inventory of helium when it enters service as well as replenishment helium during subsequent years of operation for the helium consumed each year in the supporting auxiliary equipment. The initial operating inventory for each of these 600 MWt modules would be approximately 2000 kg of helium. The annual need for makeup helium is assumed to be 10% of the operating inventory which is the upper design limit. So the annual helium requirement for a whole fleet of HTGRs is the total of the initial inventory required for new modules going into service plus the makeup supply for the existing modules already in service. As the first HTGRs are deployed, the initial inventory requirement governs the HTGR fleet helium consumption. But as the fleet grows, the makeup supply for the existing fleet quickly dominates the helium demand.

#### Supply’s on the brink now---no excess global capacity

Walter Nelson 12, Director, Helium Sourcing and Supply Chain Air Products and Chemicals, Inc, 7/20/12, Helium: Supply Shortages Impacting our Economy, National Defense and Manufacturing, Congressional Documents & Publications, p. lexis

There have been planned and unplanned maintenance outages at natural gas processing plants, as well as continuing pipeline allocations on the BLM system during well maintenance that have restricted the supply of crude helium to the U.S. refiners. In Algeria and Qatar, production of helium has decreased due to the fragile worldwide economy, as well as maintenance work at gas palnts. In addition, new helium refining projects have been slow to develop. The delayed start-up of one particular plant in Wyoming has postponed access to major new supplies of helium. Combined, these issues have reduced the global helium supply by as much as 5% to 10%.

On top of this, the industry will experience an unprecedented helium shortage this summer. Beyond the developments cited above, there are currently three US plant outages or curtailments that are severely limiting the short-term supply of helium today. First, one company reduced its helium production in Wyoming by approximately 20% beginning early June while performing critical maintenance activities. Full production is not expected to resume until sometime later this summer. The impact of this curtailment is almost five percent of global supply capacity. Second, the crude helium enrichment plant that supplies the BLM pipeline system was shut down July 15th for a planned 10 day safety critical outage. During this outage helium deliveries are limited to pipeline inventory reducing global supply capacity by an additional 25%. Third, a nautral gas plant in Kansas experienced an unplanned helium equipment outage at the end of June and that outage continued through this week. The impact of this outage was another five percent reduction in global supply capacity. In helium circles this has been "the perfect storm."

The combination of these issues has resulted in a significant short-term reduction in global helium supply capacity over the summer months. Global inventories would have normally served as a buffer during short-term outage events, minimizing the supply impacts. Unfortunately that's not the case this time. Air Products has had to allocate our customers and I suspect that all helium suppliers have had to do the same. We are caught in a cruch not of our making.

We expect some relief soon. Most of the maintenance outages will be completed within weeks, in the U.S. and abroad.That said, it will most probably take months for the global helium supply chains to recover from these summer outages.

Helium supplies will continue to remain tight through 2012 and into 2013, when new helium production is expected in Wyoming and Qatar. The Wyoming project is expected to add four percent helium capacity and the Qatar II project may add up to 18% capacity. Only after these two new plants are operational in 2013 and existing plants are running back at full output will the global supply begin to fully stabilize.

#### Helium supply constraints destroy U.S. leadership in basic scientific discovery

Phuan Ong 12, the Eugene Higgins Professor of Physics Director, Princeton Center for Complex Materials Department of Physics Princeton University, 7/20/12, Helium: Supply Shortages Impacting our Economy, National Defense and Manufacturing, Congressional Documents & Publications, p. lexis

The 2 main reasons why liquid helium is vital for research are:

1) Helium is the only fluid available for cooling samples to temperatures close to absolute zero. All objects follow the universal laws of quantum mechanics. However, at room temperature, large thermal agitations of molecules and atoms largely obscure or destroy the manifestations of quantum physics. Hence quantum behavior seems bizarre and unfamiliar to all of us. Cooling a sample suppresses the thermal agitations, allowing the quantum phenomena to become apparent. Put more directly, liquid helium is the "royal road" to discovery.

2) Helium is used to cool the superconducting wires in superconducting magnets. At present, superconducting magnets using niobium-tin (and tentatively high-Tc cuprates) provide the only known means for producing intense magnetic fields over human-sized volumes. They have to be cooled to 4 Kelvin above absolute zero to remain superconducting. With increasing demands worldwide (in research, MRI machines and in future transport), the demand for liquid helium is expected to rise sharply.

To mix metaphors, we may say that liquid helium is the vital "oxygen" that nourishes the large, dynamic U.S. research community. Disrupting this vital flow will deliver a crippling body blow to a large segment of the community, and jeopardize the leadership role of the U.S. in the coming decades. Increasingly, the pre-eminence of the U.S. in this field of physics has come under stiff challenges from groups in Germany, Japan, Netherlands, China and S. Korea. These countries have steeply increased their investments in these areas and "grown" a new generation of physicists, mostly trained in the U.S. The investment stems from the universal consensus that, in contrast to many other fundamental scientific areas, the results here underpin important future technologies.

In an increasingly flat world, it is prudent for the U.S. to safeguard the availability of this valuable national resource. From the RandD viewpoint, strong fluctuations in the price of helium or in the supply would be very harmful to the U.S. national interest.

#### Science leadership’s key to the sustainability and perceived legitimacy of U.S. hegemony---it blunts resentment of the power gap

Damon Coletta 9, Professor of Political Science at the United States Air Force Academy, September 2009, “Science, Technology, and the Quest for International Influence,” http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA536133&Location=U2&doc=GetTRDoc.pdf

Less appreciated is how scientific progress facilitates diplomatic strategy in the long run, how it contributes to Joseph Nye‘s soft power, which translates to staying power in the international arena. One possible escape from the geopolitical forces depicted in Thucydides‘ history for all time is for the current hegemon to maintain its lead in science, conceived as a national program and as an enterprise belonging to all mankind.

Beyond the new technologies for projecting military or economic power, the scientific ethos conditions the hegemon‘s approach to social-political problems. It effects how the leader organizes itself and other states to address well-springs of discontent—material inequity, religious or ethnic oppression, and environmental degradation. The scientific mantle attracts others‘ admiration, which softens or at least complicates other societies‘ resentment of power disparity. Finally, for certain global problems—nuclear proliferation, climate change, and financial crisis—the scientific lead ensures robust representation in transnational epistemic communities that can shepherd intergovernmental negotiations onto a conservative, or secular, path in terms of preserving international order.

In today‘s order, U.S. hegemony is yet in doubt even though military and economic indicators confirm its status as the world‘s lone superpower. America possesses the material wherewithal to maintain its lead in the sciences, but it also desires to bear the standard for freedom and democracy. Unfortunately, patronage of basic science does not automatically flourish with liberal democracy.

The free market and the mass public impose demands on science that tend to move research out of the basic and into applied realms. Absent the lead in basic discovery, no country can hope to pioneer humanity‘s quest to know Nature. There is a real danger U.S. state and society could permanently confuse sponsorship of technology with patronage of science, thereby delivering a self-inflicted blow to U.S. leadership among nations.

#### Legitimacy of U.S. hegemony’s key to global stability---prevents great power war

Kevin Fujimoto 12, Lt. Colonel, U.S. Army, January 11, 2012, “Preserving U.S. National Security Interests Through a Liberal World Construct,” online: <http://www.strategicstudiesinstitute.army.mil/index.cfm/articles/Preserving-US-National-Security-Interests-Liberal-World-Construct/2012/1/11>

The emergence of peer competitors, not terrorism, presents the greatest long-term threat to our national security. Over the past decade, while the United States concentrated its geopolitical focus on fighting two land wars in Iraq and Afghanistan, China has quietly begun implementing a strategy to emerge as the dominant imperial power within Southeast Asia and the Indian Ocean. Within the next 2 decades, China will likely replace the United States as the Asia-Pacific regional hegemonic power, if not replace us as the global superpower.1 Although China presents its rise as peaceful and non-hegemonic, its construction of naval bases in neighboring countries and military expansion in the region contradict that argument.

With a credible threat to its leading position in a unipolar global order, the United States should adopt a grand strategy of “investment,” building legitimacy and capacity in the very institutions that will protect our interests in a liberal global construct of the future when we are no longer the dominant imperial power. Similar to the Clinton era's grand strategy of “enlargement,”2 investment supports a world order predicated upon a system of basic rules and principles, however, it differs in that the United States should concentrate on the institutions (i.e., United Nations, World Trade Organization, ASEAN, alliances, etc.) that support a world order, as opposed to expanding democracy as a system of governance for other sovereign nations.

Despite its claims of a benevolent expansion, China is already executing a strategy of expansion similar to that of Imperial Japan's Manchukuo policy during the 1930s.3 This three-part strategy involves: “(i) (providing) significant investments in economic infrastructure for extracting natural resources; (ii) (conducting) military interventions (to) protect economic interests; and, (iii) . . . (annexing) via installation of puppet governments.”4 China has already solidified its control over neighboring North Korea and Burma, and has similarly begun more ambitious engagements in Africa and Central Asia where it seeks to expand its frontier.5

Noted political scientist Samuel P. Huntington provides further analysis of the motives behind China's imperial aspirations. He contends that “China (has) historically conceived itself as encompassing a “‘Sinic Zone'. . . (with) two goals: to become the champion of Chinese culture . . . and to resume its historical position, which it lost in the nineteenth century, as the hegemonic power in East Asia.”6 Furthermore, China holds one quarter of the world's population, and rapid economic growth will increase its demand for natural resources from outside its borders as its people seek a standard of living comparable to that of Western civilization.

The rise of peer competitors has historically resulted in regional instability and one should compare “the emergence of China to the rise of. . . Germany as the dominant power in Europe in the late nineteenth century.”7 Furthermore, the rise of another peer competitor on the level of the Soviet Union of the Cold War ultimately threatens U.S. global influence, challenging its concepts of human rights, liberalism, and democracy; as well as its ability to co-opt other nations to accept them.8 This decline in influence, while initially limited to the Asia-Pacific region, threatens to result in significant conflict if it ultimately leads to a paradigm shift in the ideas and principles that govern the existing world order.

A grand strategy of investment to address the threat of China requires investing in institutions, addressing ungoverned states, and building legitimacy through multilateralism. The United States must build capacity in the existing institutions and alliances accepted globally as legitimate representative bodies of the world's governments. For true legitimacy, the United States must support these institutions, not only when convenient, in order to avoid the appearance of unilateralism, which would ultimately undermine the very organizations upon whom it will rely when it is no longer the global hegemon.

The United States must also address ungoverned states, not only as breeding grounds for terrorism, but as conflicts that threaten to spread into regional instability, thereby drawing in superpowers with competing interests. Huntington proposes that the greatest source of conflict will come from what he defines as one “core” nation's involvement in a conflict between another core nation and a minor state within its immediate sphere of influence.9 For example, regional instability in South Asia10 threatens to involve combatants from the United States, India, China, and the surrounding nations. Appropriately, the United States, as a global power, must apply all elements of its national power now to address the problem of weak and failing states, which threaten to serve as the principal catalysts of future global conflicts.11

Admittedly, the application of American power in the internal affairs of a sovereign nation raises issues. Experts have posed the question of whether the United States should act as the world's enforcer of stability, imposing its concepts of human rights on other states. In response to this concern, The International Commission on Intervention and State Sovereignty authored a study titled, The Responsibility to Protect,12 calling for revisions to the understanding of sovereignty within the United Nations (UN) charter. This commission places the responsibility to protect peoples of sovereign nations on both the state itself and, more importantly, on the international community.13 If approved, this revision will establish a precedent whereby the United States has not only the authority and responsibility to act within the internal affairs of a repressive government, but does so with global legitimacy if done under the auspices of a UN mandate.

Any effort to legitimize and support a liberal world construct requires the United States to adopt a multilateral doctrine which avoids the precepts of the previous administration: “preemptive war, democratization, and U.S. primacy of unilateralism,”14 which have resulted in the alienation of former allies worldwide. Predominantly Muslim nations, whose citizens had previously looked to the United States as an example of representative governance, viewed the Iraq invasion as the seminal dividing action between the Western and the Islamic world. Appropriately, any future American interventions into the internal affairs of another sovereign nation must first seek to establish consensus by gaining the approval of a body representing global opinion, and must reject military unilateralism as a threat to that governing body's legitimacy.

Despite the long-standing U.S. tradition of a liberal foreign policy since the start of the Cold War, the famous liberal leviathan, John Ikenberry, argues that “the post-9/11 doctrine of national security strategy . . . has been based on . . . American global dominance, the preventative use of force, coalitions of the willing, and the struggle between liberty and evil.”15 American foreign policy has misguidedly focused on spreading democracy, as opposed to building a liberal international order based on universally accepted principles that actually set the conditions for individual nation states to select their own system of governance. Anne-Marie Slaughter, the former Dean of the Woodrow Wilson School of Public and International Affairs, argues that true Wilsonian idealists “support liberal democracy, but reject the possibility of democratizing peoples . . .”16 and reject military primacy in favor of supporting a rules-based system of order.

Investment in a liberal world order would also set the conditions for the United States to garner support from noncommitted regional powers (i.e., Russia, India, Japan, etc.), or “swing civilizations,” in countering China's increasing hegemonic influence.17 These states reside within close proximity to the Indian Ocean, which will likely emerge as the geopolitical focus of the American foreign policy during the 21st century, and appropriately have the ability to offset China's imperial dominance in the region.18

Critics of a liberal world construct argue that idealism is not necessary, based on the assumption that nations that trade together will not go to war with each other.19 In response, foreign affairs columnist Thomas L. Friedman rebukes their arguments, acknowledging the predicate of commercial interdependence as a factor only in the decision to go to war, and argues that while globalization is creating a new international order, differences between civilizations still create friction that may overcome all other factors and lead to conflict.20

Detractors also warn that as China grows in power, it will no longer observe “the basic rules and principles of a liberal international order,” which largely result from Western concepts of foreign relations. Ikenberry addresses this risk, citing that China's leaders already recognize that they will gain more authority within the existing liberal order, as opposed to contesting it. China's leaders “want the protection and rights that come from the international order's . . . defense of sovereignty,”21 from which they have benefitted during their recent history of economic growth and international expansion.

Even if China executes a peaceful rise and the United States overestimates a Sinic threat to its national security interest, the emergence of a new imperial power will challenge American leadership in the Indian Ocean and Asia-Pacific region. That being said, it is more likely that China, as evidenced by its military and economic expansion, will displace the United States as the regional hegemonic power. Recognizing this threat now, the United States must prepare for the eventual transition and immediately begin building the legitimacy and support of a system of rules that will protect its interests later when we are no longer the world's only superpower.

## 1NR

#### Current tightness in the market is unprecedented---makes tradeoffs highly likely

Walter Nelson 12, Director, Helium Sourcing and Supply Chain Air Products and Chemicals, Inc, 7/20/12, Helium: Supply Shortages Impacting our Economy, National Defense and Manufacturing, Congressional Documents & Publications, p. lexis

As my testimony will explain at length, the current tightness in the helium market is unprecedented. Air Products and others in the industrial gas business are the victims here, along with our customers. The factors contributing to supply disruptions range from reduced extraction of helium-rich gases, planned and unplanned outages of both domestic and foreign helium processing plants and delays in commencing operations of new helium refineries. Shortages are especially acute as a result of the planned outage of the Bureau of Land Management system this July, the timing of which we consider non-negotiable on safety grounds.

#### Absolutely zero excess capacity---this is basically the sickest tradeoff DA ever

Tom Thoman 12, Airgas Division President - Gases Production, Airgas, Inc, 7/20/12, Helium: Supply Shortages Impacting our Economy, National Defense and Manufacturing, Congressional Documents & Publications, p. lexis

As the Committee is well aware, our nation currently faces a helium shortage that is having an adverse effect on the domestic economy and its ability to create jobs. By way of example, the supply chain is stretched so thin that Airgas has been forced to place our contract customers on reduced resource allocations, and to cease deliveries to non-contract customers for the simple reason that we are unable to procure the necessary supplies. For our customer base, the restricted supplies have had significant real world consequences. Whether that means decreased economic activity for manufacturers, welders, and petrochemical refiners; constrained MRI scans for health care providers; or limitations on research, the fact of the matter is that the helium shortage is impacting most Americans whether they realize it or not. In our view, this is not a tenable situation.

#### No slack in the helium market---new supplies are far off and they’ll be fully consumed by current demand

John Campbell 12, Former Member of the National Research Council's Committee on Understanding the Impact of Selling the Helium Reserve President and CEO of J.R. Campbell and Associates, 7/20/12, Helium: Supply Shortages Impacting our Economy, National Defense and Manufacturing, Congressional Documents & Publications, p. lexis

Tight supply is the most notable aspect of this year's review of worldwide helium market. Uncertainties relating to timing of future supply sources, projecting market demand during uncertain economic times, and the United States' Bureau of Land Management's (BLM) changing role in supply make this a challenging market to manage. This year was particularly tough with supply disruptions at most major sources of helium across the globe. Disruptions were caused by a range of factors including the lack of feedstock from LNG plants caused by lower consumption during the economic recession, planned and prolonged planned shutdowns, the Russian discontinuation of exports, and trouble maintaining pressure in the BLM pipeline, a system entering declining stages of output. The tight supply of helium is expected to remain until significant new planned supply comes on at Qatar II in mid-2013, with two projects due to come on line prior to end 2013 providing some respite. These include the startup of the Air Products/ MATHESON joint venture at Riley Ridge in Wyoming schedule for late 2012 and the Skikda LNG megatrain plant coming on mid 2013, which will supply additional feedgas volumes to their existing helium plant. We expect that these additional supplies will be fully consumed by increasing demand.

#### The plan requires 5% of global helium production forever---sets a new demand floor

Mark Haynes 10, President, Concordia Power, 5/13/10, “UP IN THE AIR: THE BLM'S DISAPPEARING HELIUM PROGRAM,” http://www.gpo.gov/fdsys/pkg/CHRG-111hhrg56392/html/CHRG-111hhrg56392.htm

On behalf of the Next Generation Nuclear Plant Industrial Alliance, I am writing to bring to your attention the importance of helium to what may ultimately prove to be one of the most important future energy options: high temperature gas cooled reactors or HTGRs. HTGRs are quite different from the water cooled reactors that constitute the vast majority of the world's existing nuclear fleet. By utilizing helium as a coolant, along with other important design and materials differences, HTGRs exhibit unparalleled safety characteristics and are able to operate in high temperature regimes that make it possible for them to ultimately supplant fossil fuel use and substantially reduce greenhouse gas production in many industrial and transportation uses. The attached one page summary discusses these uses.

In the overall picture of current world helium production(193,000 cubic meters in 2008), HTGR use is not large. A deployment of 1,000 HTGR modules would use about 5.0% of the world's current production on an ongoing basis. It is important to assure, however, that future helium supplies and production are managed to enable a long-term supply for the HTGR nuclear energy technology.

#### Even if the plan doesn’t force a supply shortfall in the helium market, it still massively drives up the price---that’s sufficient to trigger the link

Rod Adams 10, Founder, Adams Atomic Engines, Inc., 2/28/10, “One Reason for Choosing Nitrogen (N2) for Adams Engines is the Growing Scarcity of Helium,” http://adamsengines.blogspot.com/2010/02/one-reason-for-choosing-nitrogen-n2-for.html

One of the reasons that I decided to use N2 gas as the coolant for Adams EnginesTM is the fact that helium supplies are limited enough so that a new large demand would drive up the price of the gas. I fully expect that someday, direct cycle gas turbines using nuclear heat sources will have the potential for rapid market expansion; I determined a long time ago that I did not want to limit the potential for that expansion based on a limit to the amount of available helium.

Since it is an element and a noble gas that is produced by a very slow process - decay of uranium, thorium and their daughter products - helium could be the bottleneck that would slow development and deployment of Adams EnginesTM. I can point to a lot of esoteric science papers that supported the decision to go in a completely different direction than the conventional gas cooled reactor wisdom as practiced by companies like PBMR and General Atomics, but this video does a much more entertaining job of sharing the reasons for my concern.

#### Their link defense depends on new international production coming on line and slack in the global market---that’s not happening now, and all our uniqueness evidence proves it won’t in the near term---means HTGRs tip the market into supply constraints and price spikes

Brian K. Castle 11, Idaho National Laboratory, Next Generation Nuclear Plant Project, February 2011, “NGNP Infrastructure Readiness Assessment: Consolidation Report,” Contract DE-AC07-05ID14517

Conversely, we know of no new helium extraction facilities that are expected to come on line in the U.S. in the near future although new facilities in Algeria and Qatar were expected to begin production in 2005 and 2006, respectively. Startup of the facility in Algeria was delayed because of an explosion in a faulty boiler in the natural gas plant and we do not know its current status. It is possible that demand will begin to exceed supply in the near term if there are further delays in foreign production. Should foreign supply not meet expectations, a faster drawdown in the U.S. helium reserves could occur and may “squeeze” the supply, driving prices to higher levels in the future.

5.2.3 Helium Requirements for HTR Deployment

The helium inventory required by each reactor module depends on the specific configuration, but a reasonable assumption is 2000 kg of helium per reactor module. The required helium supply for each reactor module must include both the initial inventory and makeup supply for operating losses. A conservative assumption is to assume the loss of one inventory per year for each module. For example the MHTGR leakage requirement is only 10% of the primary inventory per year. Assuming 1 inventory per year means a single reactor module would require 2000 kg per year for sustained operation. This is a trivial quantity in the context of the overall annual helium market. The existing helium infrastructure can readily meet this need.

The ability of the helium infrastructure to support a whole fleet of plants is a more significant question. For a fleet of 500 reactor modules, the total annual helium requirement would be at the most about 1,000,000 kg per year. This compares to annual global production of over 30 million kg/year. Therefore, a fleet of HTGRs would be conservatively expected to require only about three percent of current annual global production. If helium is also used for high temperature heat transport loops, this would increase the total helium requirement somewhat, but the basic conclusion would not change. A fleet of HTGRs would not have a large effect on the global helium market.

#### Helium supplies will be sufficient to meet current demand because U.S. demand growth is slow

John Campbell 12, Former Member of the National Research Council's Committee on Understanding the Impact of Selling the Helium Reserve President and CEO of J.R. Campbell and Associates, 7/20/12, Helium: Supply Shortages Impacting our Economy, National Defense and Manufacturing, Congressional Documents & Publications, p. lexis

The industry consensus is that the helium market should be able to recover demand levels by late 2013 when planned major new supply is added. This projection reflects a best estimate based on known demand data and historical information on how helium markets have recovered in past economic downturns. CryoGas International discussed this helium demand scenario and projections for future growth in North America, Europe, Asia, and the ME with the major gas companies. We also reviewed the applications behind the demand and the basis for growth in the fastest growing segments.

The overall consensus among industrial gas producers is that new demand for helium will grow the fastest in Asia at around 7-10 percent and in the ME at around 4-7 percent. Demand growth in the US and in Europe will be slower, 1-2 percent projected in the US and 2-3 percent in Europe.

The electronics industry will remain the main growth driver for helium as that market has rebounded more quickly than others. The growth in Asia can be expected to be broad-based, encompassing electronics-related segments, such as fiber optics, LCD, and semiconductor manufacturing, and general manufacturing and healthcare related applications as the overall economy expands.

Currently, the US remains the largest market for helium demand worldwide, at about 37 percent, or about 2.3 Bcf/yr, as shown in Figure 2. The rate of demand growth for helium in the US has declined since 2000 as large markets for helium, such as MRI, matured. Debt issues in the US and Europe as well as increased helium conservation and recycle measures are also responsible for reduced demand in these more mature markets.

#### Current supply expansions will only meet demand if it stays on its current trajectory---plan upsets the balance---prices are on the brink

John Campbell 12, Former Member of the National Research Council's Committee on Understanding the Impact of Selling the Helium Reserve President and CEO of J.R. Campbell and Associates, 7/20/12, Helium: Supply Shortages Impacting our Economy, National Defense and Manufacturing, Congressional Documents & Publications, p. lexis

As noted, new sources and expansions to helium capacity/production have come on-stream or are planned in Darwin, Australia, Riley Ridge in the US, and in the ME/Africa (i.e., Qatar II and Skikda) during the next three years. These sources should be sufficient to meet worldwide demand for the next four years, given moderate growth in demand and continued global economic recovery. Figures 7 to 8 address the difference between Nameplate Capacity and Maximum Deliverable Production volumes. That difference accounts for supply disruptions at helium sources across the globe, lack of feedstock from LNG plants caused by lower consumption during the economic recession, as well as planned and prolonged planned shutdowns. There should be adequate future sources of helium from natural gas projects, even in the US (i.e., carbon dioxide recovery for enhanced oil recovery projects like the one being considered by Kinder Morgan in St. Johns, AZ). However, consensus is that they will provide helium at much higher prices than users are accustomed to paying.

#### Warming---it’s extinction

Flournoy 12 – Citing Feng Hsu, PhdD NASA Scientist @ the Goddard Space Flight Center, Don FLournoy, PhD and MA from UT, former Dean of the University College @ Ohio University, former Associate Dean at SUNY and Case Institute of Technology, Former Manager for Unviersity/Industry Experiments for the NASA ACTS Satellite, currently Professor of Telecommunications @ Scripps College of Communications, Ohio University, “Solar Power Satellites,” January 2012, Springer Briefs in Space Development, p. 10-11

In the Online Journal of Space Communication , Dr. Feng Hsu, a  NASA scientist at Goddard Space Flight Center, a research center in the forefront of science of space and Earth, writes, “The evidence of global warming is alarming,” noting the potential for a catastrophic planetary climate change is real and troubling (Hsu 2010 ) . Hsu and his NASA colleagues were engaged in monitoring and analyzing climate changes on a global scale, through which they received first-hand scientific information and data relating to global warming issues, including the dynamics of polar ice cap melting. After discussing this research with colleagues who were world experts on the subject, he wrote: I now have no doubt global temperatures are rising, and that global warming is a serious problem confronting all of humanity. No matter whether these trends are due to human interference or to the cosmic cycling of our solar system, there are two basic facts that are crystal clear: (a) there is overwhelming scientific evidence showing positive correlations between the level of CO2 concentrations in Earth’s atmosphere with respect to the historical fluctuations of global temperature changes; and (b) the overwhelming majority of the world’s scientific community is in agreement about the risks of a potential catastrophic global climate change. That is, if we humans continue to ignore this problem and do nothing, if we continue dumping huge quantities of greenhouse gases into Earth’s biosphere, humanity will be at dire risk (Hsu 2010 ) . As a technology risk assessment expert, Hsu says he can show with some confidence that the planet will face more risk doing nothing to curb its fossil-based energy addictions than it will in making a fundamental shift in its energy supply. “This,” he writes, “is because the risks of a catastrophic anthropogenic climate change can be potentially the extinction of human species, a risk that is simply too high for us to take any chances” (Hsu 2010 )

#### Scientific diplomacy’s the largest area of U.S.-China cooperation---turns and outweighs the aff

Norman P. Neureiter 12, serves as the chair of Science & Diplomacy's Senior Advisory Board, March 2012, “Science and Diplomacy: The Past as Prologue,” http://www.sciencediplomacy.org/editorial/2012/science-and-diplomacy

The year 1972 saw two brilliant and totally unexpected diplomatic initiatives that rearranged the geopolitical construct of the world—and science played a role in each. For President Richard Nixon’s historic visit to China, his National Security Advisor Henry Kissinger had asked the White House Office of Science and Technology (then headed by Edward David) to prepare specific proposals for science cooperation. Nixon and Kissinger wanted to offer the Chinese something concrete, something substantive beyond the policy changes that were at the heart of the visit. In the remarkable Shanghai Communiqué, which was signed at the end of the visit, they included science as one of the areas noted for future cooperation between the United States and China. Today, U.S. science and technology (S&T) collaboration with China is one of America’s largest cooperative programs, and productive relationships exist across multiple disciplines. While for many Americans today, China is seen more as a competitor than a partner in applying science to solve the broad challenges facing the world, the reality is that science cooperation has provided great benefits to both countries in areas ranging from climate change and environment to energy and food security, among others. These relationships have also made it possible for AAAS to convene joint U.S.-China workshops on ethical standards in the practice of science—essential to effective long-term cooperation.

#### Reliable helium supply at stable prices key to advanced semiconductors

SIA 12– Semiconductor Industry Association, 7/10/12, “Helium: Supply Shortages Impacting our Economy, National Defense and Manufacturing,” http://www.sia-online.org/clientuploads/directory/DocumentSIA/Helium%20testimony%20120801%20(2).pdf

Helium's unique physical and chemical properties have made it critical to the manufacture of semiconductors. The industry uses helium because it is very inert, has a very low boiling point (at 4 degrees K, near absolute zero), and due to its high thermal conductivity. Some of principle uses of helium in the semiconductor industry are as a carrier gas for deposition processes, as a dilutant gas in plasma etch processes, and in some specialized wafer cooling applications. It is also critical in leak detection. Helium is used to achieve ultra-clean manufacturing and assembly environments that are essential for advanced semiconductor manufacturing. 1 According to a report of the National Academy of Sciences, semiconductor and optical fiber manufacturing account for 13 percent of uses of helium; 2 suppliers to the industry have indicated to us that semiconductor uses account for approximately 6 percent of helium usage. In some applications, alternatives such as argon or nitrogen may be used, but this typically results in a decrease in throughput.

For these reasons, a reliable supply of helium at stable prices remains critical to the manufacturing process and continued health of the U.S. semiconductor manufacturing industry.

#### That’s key to the DOD Global Information Grid

Lawrence K. Harada 10, Colonel, United States Army Reserve, 4/21/10, “SEMICONDUCTOR TECHNOLOGY AND U.S. NATIONAL SECURITY,” http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA526581

America’s National Interests, National Defense Strategy, and National Military Strategy highlight the importance of semiconductor technology to national security. Two related national interests interconnect China’s rise with the semiconductor industry. America’s National Interests identifies productive relations with China as a vital interest. An extremely important interest is to maintain a lead in ―strategic technologies, particularly information systems‖ 16 of which semiconductor technology is the key component. Similarly, The National Defense Strategy stresses not only the importance of technology, but also to invest in ―the right kinds of technology‖ 17 to stay ahead of potential adversaries. The National Military Strategy details the advantages of the networked force and the speed of information that implies extremely fast semiconductors. 18 The Defense Science Board (DSB) Task Force on High Performance Microchip Supply also concluded that national security depends upon the U.S.-based semiconductor competitiveness from research and development (R&D), design and manufacturing. 19 The guidance on the importance of semiconductor technology to national security is unequivocal. Yet, DOD and intelligence agencies find themselves in a dilemma.

Semiconductor technologies that support U.S. national security also fuel the much larger worldwide economy. As a result, most semiconductor technologies for leading edge military applications arise from the commercial industry and not the military sector. 20 The importance of semiconductor technology to U.S. national security cannot be understated. Largely ignored as the intelligence inside U.S. military weapon systems, semiconductor technologies ―provide the force multipliers that made the revolution in military affairs possible.‖ 21 In Joint Vision 2020, semiconductor technology is the implied driver of the military transformation that will enhance the capabilities and the ―revolution of joint command and control.‖ 22 As the U.S. military moves to a networkcentric force, the demands for extremely fast microchips will increase. DOD’s Global Information Grid (GIG) requires high-speed connectivity, encryption, and decryption to support both weapon platforms and the soldier on the battlefield. 23 The ability to sustain and even surpass these high-speed requirements rests with the U.S. semiconductor industry.

#### GIG’s key to battlefield superiority and nuclear C2

DOD 1 – Department of Defense, 7/27/1, “Network Centric Warfare,” http://www.dodccrp.org/files/ncw\_report/report/ncw\_main.pdf

The concept of a “Global Information Grid” was born out of concerns regarding interoperability and end-to-end integration of automated information systems. Issues such as streamlined management and the improvement of information infrastructure investment have also contributed to the heightened interest in the GIG. The real demand for a GIG is driven by the requirement for Information Superiority and decision superiority as expressed in Joint Vision 2020, and discussed previously in Section 2.2.

Today’s threats present a wide array of asymmetric challenges to warfighting capability across the variety of warfighting missions the US military undertakes in both Joint and Multinational environments. These missions are tasked around the world in support of ad hoc military and civil structures. The current IT infrastructure constructs no longer optimally meet the globally distributed information superiority needs of warfighters and sustainers within the increasingly important context of coalition operations. The GIG will provide the Joint and coalition warfighter with a single, end-to-end information system capability that includes a secure network environment, allowing users to access shared data and applications, regardless of location, and supported by a robust network/information-centric infrastructure.

The GIG is a system of systems (SoS) that provides a set of value-added functions operating in a global context to support processing, storage, and transport of information; human-GIG interaction; network management; information dissemination management; and information assurance (IA). These functions are fully interrelated, integrated, and interoperable with one another in order to achieve overall interoperability across the GIG. The integration of these functions is portrayed in the GIG Systems Reference Model and GIG Sub-Systems View, portrayed in Figures 9-1 and 9-2. As a result, the GIG is an information environment comprised of interoperable computing and communication components.

The GIG is essential for information and decision superiority. It will enable C4I integration of Joint forces, improve interoperability of systems, and increase optimization of bandwidth capacity, thereby dramatically improving the warfighting capabilities of Joint forces across the full spectrum of conflict. The GIG will enhance operational capabilities while providing a common operational environment for conventional and nuclear command and control (C2), combat support, combat service support, intelligence, and business functions. In particular, the GIG will support:

• Warfighters’ ability to operate with reduced forces at high operational tempos where dynamic planning and redirection of assets is the norm

• Delivery of information concerning targets, movement of forces, condition of equipment, levels of supplies, and disposition of assets to Joint commanders, their forces, and the National Command Authority within required timeframes

• Warfighters’ ability to obtain and use combat and administrative support information from national and widely dispersed assets

• Collection, processing, storage, distribution, and display of information horizontally and vertically throughout organizational structures across the battlespace

• Rapid and seamless flow and exchange of information around the globe to enable collaborative mission planning and execution from widely dispersed locations and at different levels (to include strategic, operational, tactical, and business)

• Timely, assured connectivity and information availability for decision makers and their advisors to support effective decision making

# Biofuels DA

#### HTGRs provide industrial process heat for biofuels production

Jack Thornton 11, American Society of Mechanical Engineers, November 2011, “The Next Generation of Nuclear Reactors,” http://www.asme.org/kb/news---articles/articles/nuclear/the-next-generation-nuclear-reactors

The high-temperature reference is to the reactor’s outlet temperature, about 750-925 °C, or very roughly three times higher than most of today’s reactors. That means HTGRs can be a source of low-carbon, high-temperature process heat for petroleum refining, biofuels production, the production of fertilizer and chemical feedstocks, and reprocessing coal into other fuels, among other uses. This is why the NGNP Alliance includes Dow Chemical, Eastman Chemical, ConocoPhillips, Potash Corp., and the Petroleum Technology Alliance of Canada. All are potential customers for NGNP’s clean heat and electricity.

#### That insulates producers from otherwise inevitable natural gas price spikes

Mark Haynes 12, President, Concordia Power, 7/20/12, “Helium: Supply Shortages Impacting our Economy, National Defense and Manufacturing,” http://naturalresources.house.gov/uploadedfiles/haynestestimony07-20-12.pdf

Industry currently uses 20% of the energy in the US and 30% world-wide. In the US, this is primarily from burning of fossil fuels such as natural gas and petroleum derivatives to produce high temperature process heat

High temperature nuclear reactors designed to produce process heat can displace a substantial part of this fossil fuel usage – dramatically reducing associated carbon emissions. The process heat temperatures achievable by High Temperature Gas Cooled Reactor (HTGR) technology can fulfill the process heat needs of major industrial facilities

Process heat produced by HTGRs is competitive with fossil fuels and isolates industrial energy users from volatile energy prices historically associated with fossil fuels. Likewise, HTGR generated electric power is competitive with that of other newly built nuclear and fossil fuel generation.

#### Sustained low prices for process heat are the only thing that can cause a large-scale biofuel expansion---current low natural gas prices are temporary

Jim Lane 12, Biofuels Digest, April 20, 2012, “Falling natural gas prices and the bio-based opportunity,” online: http://www.biofuelsdigest.com/bdigest/2012/04/20/falling-natural-gas-prices-and-the-bio-based-opportunity/

Think that falling natural gas prices mean bad news for bio-based technologies? Don’t bet on it. There’s opportunity in there.

On the chance that you were engaged in interstellar travel, or cryogenically frozen, over the past two years – US natural gas prices and global oil prices have completely decoupled, for the first time in living memory. For a long, long time, a barrel of oil cost just around 10 times the cost of a million BTUs of natural gas, or about 70 percent more on a BTU basis.

Today, a barrel of oil is available at 50 times the cost of a million BTUs of natural gas. In addition to oil prices rising, primarily as the result of Middle East tensions and rising demand from developing countries – there has been, in the US, a massive drop in natural gas prices owing to the impact of new technologies for liberating gas from shale.

For chemical plants that utilize natural gas as a feedstock, it means opportunity, and they have responded vigorously. Yesterday, Dow unveiled plans for a new, $1.7 billion, 1.5 million metric ton steam cracker in Freeport, Texas that will start producing ethylene in 2017, part of a $4 billion investment by the company in expanded US production in response to falling feedstock prices.

Only last month, Shell announced a strikingly similar, $2 billion project in Pennsylvania, while Chevron Phillips (a JV of ConocoPhillips and Chevron) is planning a project in Texas, Formosa Plastics has announced a $1.7 billion project for Texas, along with a liquid natural gas project announced by Freeport Development. LyondellBasell and Occidental are also looking at major projects along the Gulf Coast.

Falling feedstock prices?

That catalyst for economic activity should be a watched carefully by bio-based growers, whose technologies currently are scheduled to produce liquid fuels and chemicals at prices competitive with anywhere from $30 oil to $100 oil. Nothing is scheduled to compete with $20 oil, which is where oil prices were the last time natural gas was available for $2 per MMBTUs, back in 2002.

Many have described the divergence between natural gas and oil as a temporary phenomenon that will return to equilibrium because of a slowdown in development of gas projects. But high oil prices encourage more drilling, and natural gas is a by product of those projects, Fully 75 percent of the increase in US gas production this year is expected to be a consequence of increase oil drilling, according to Bloomberg Business Week.

The key takeaway from falling natural gas prices

Processing technology investments follow cheap feedstock, and transformational processing technology is a liberator of value by unlocking low-cost feedstocks that were previously untappable.

One of the reasons why technologies from the likes of Enerkem, Terrabon, INEOS Bio and Fulcrum, that utilize zero-cost municipal solid waste, remain highly prized, and may push the Enerkem and Fulcrum IPOs over the finishing line this spring.

Problem there is abundance of aggregated feedstock. Generally speaking, the projects contemplated by the developers range from 10-30 million gallons, and that is generally a function of the transportation cost for the feedstock, which generally must be brought in by truck, barge or rail.

For biofuels, it reminds that feedstock yield intensification is an absolute must for expansion – both in providing lower overall costs (while providing sufficient return to the grower), and in providing larger concentrations of biomass that will make larger projects more feasible. Larger projects have lower technology costs – and attract more attention from end-use fuels and chemical companies who, on the whole, have been generally underwhelmed by the scale of proposed biofuels operations.

Other potential winners in the bio-based space from high oil prices and falling gas prices?

Outside the North American market

From the EU to Asia, gas and oil prices remain largely in their traditional relationship. There, consumers should be expected to demand diversification away from oil as a strategy to limit price volatility and combat emissions.

Many first generation ethanol plants.

The more modern plants use natural gas – and a lot of of it, to provide the process heat for ethanol production. Lower natural gas input prices, lower ethanol prices. That simple.

LanzaTech

As the company says, “our patented, wholly-owned microbe that uses gas feeds as its sole source of carbon and energy for fuel and chemical production. Our microbe is feedstock agnostic and [can use] steam reformed methane that is rich in hydrogen.

Sundrop Fuels

In Colorado, Sundrop Fuels announced that they have agreed to purchase about 1,200 acres of land near Alexandria, Louisiana to build their first plant. Using forest waste and hydrogen from natural gas, their plant will produce up to 50 MGy of renewable gasoline. The plant will cost $450 to $500 million to build and will be financed in part through the sale of tax-exempt Private Activity Bonds.

The biofuels plant will salvage wood waste from renewable forests in Central Louisiana and adjacent regions and use that biomass as a feedstock. Sundrop Fuels also will extract hydrogen from abundant supplies of Louisiana natural gas, combining the hydrogen in a proprietary reactor with carbon extracted from wood waste. The result — up to 50 million gallons of fuel a year — will represent the world’s first renewable green gasoline that’s immediately adaptable to existing pumps, pipelines, engines and transportation infrastructure.

Siluria

Last October, we reported, “In California, Siluria has attracted $20 million for a technology platform to convert methane to chemicals, plastics, and fuels. Siluria’s Series B financing was led by the U.K. based Wellcome Trust, joining Siluria’s founding investors Alloy Ventures, ARCH Venture Partners, Kleiner Perkins Caufield & Byers, Altitude Life Science Ventures, Lux Capital, and Presidio Ventures in this Series B.”

Siluria’s technology? Researchers Erik Scher and Alex Tkachenko of Siluria Technologies in San Francisco stated that the metals coating the virus form a nanotube structure they refer to as a “hairball”, giving the catalyst a greater surface area, which enhances the reactions. This conversion happens at temperatures 200 to 300 below current steam cracking methods, greatly reducing the energy needed by current technology to produce ethylene. This attempt to commercialize a bio-technique of forming nanostructures is based on Dr. Angela Belcher’s work at M.I.T, where she leads the Biomolecular Materials Group. Her lab is currently researching a number of uses including biofuels and hydrogen production for fuel cells.”

Glori Energy

Glori Energy’s mission is to sustainably and efficiently recover oil trapped in reservoirs using existing oil wells through the deployment of its microbe-based Activated Environment for Recovery of Oil (AERO) System. AERO enhances production from waterflooded wells by stimulating a reservoir’s naturally occurring microbes to improve water sweep and oil mobility. Waterflood technology injects water into reservoirs to release additional quantities of oil that were unrecoverable during primary recovery. Conventional waterflooding only extracts a fraction of all discovered oil, leaving the majority underground. The AERO System provides a new, viable option to recover this trapped oil with minimal new footprint or investment.

The Bottom Line

Last month, we urged observers of the bio-based space to think beyond green, to think about the opportunities in the Olive Economy – where the new green meets the old brown. This week demonstrates that chemical producers, for one, will put their capital to work if they see real, transformational shifts in feedstock opportunities.

#### Large-scale ethanol production causes extinction

Tad Patzek 8, professor of Civil and Environmental Engineering at UC-Berkeley, 2008, “Can the Earth Deliver the Biomass-for-Fuel we Demand,” in Biofuels, Solar, and Wind as Renewable Energy Systems, ed. Pimentel, p. 36-44

Physics, chemistry and biology say clearly that there can be no sustained net mass output from any ecosystem for more than a few years. A young forest in a temperate climate grows fast in a clear-cut area, see Fig. 2.16, and transfers nutrients from soil to the young trees. The young trees grow very fast (there is a positive NPP). but the amount of mass accumulated in the forest is small. When a tree burns or dies some or most of its nutrients go back to the soil. When this tree is logged and hauled away, almost no nutrients are returned. After logging young trees a couple of times the forest soil becomes depleted, while the populations of insects and pathogens are well-established, and the forest productivity rapidly declines (Patzek and Pimemel. 2006). When the forest is allowed to grow long enough, its net ecosystem productivity becomes zero on the average.

Therefore, in order to export biomass (mostly water, but also carbon, oxygen, hydrogen and a plethora of nutrients) an ecosystem must import equivalent quantities of the chemical elements it lost, or decline irreversibly. Carbon comes from the atmospheric CO2 and water flows in as rain, rivers and irrigation from mined aquifers and lakes. The other nutrients, however, must be rapidly produced from ancient plant matter transformed into methane, coal, petroleum, phosphates.17 etc., as well as from earth minerals (muriate of potash, dolomites, etc.), - all irreversibly mined by humans. Therefore, to the extent that humans are no longer integrated with the ecosystems in which they live, they are doomed to extinction by exhausting all planetary stocks of minerals, soil and clean water. The question is not if, but how fast.

It seems that with the exponentially accelerating mining of global ecosystems for biomass, the time scale of our extinction is shrinking with each crop harvest. Compare this statement with the feverish proclamations of sustainable biomass and agrofuel production that flood us from the confused media outlets, peer-reviewed journals, and politicians.

2.5.3 Is There any Other Proof of NEP = 0?

I just gave you an abstract proof of no trash production in Earth's Kingdom, except for its dirty human slums.

Are there any other, more direct proofs, perhaps based on measurements? It turns out that there are two approaches that complement each other and lead to the same conclusions. The first approach is based on a top-down view of the Earth from a satellite and a mapping of the reflected infrared spectra into biomass growth. I will summarize this proof here. The second approach involves a direct counting of all crops, grass, and trees, and translating the weighed or otherwise measured biomass into net primary productivity of ecosystems. Both approaches yield very similar results.

2.5.4 Satellite Sensor-Based Estimates

Global ecosystem productivity can be estimated by combining remote sensing with a carbon cycle analysis. The US National Aeronautics and Space Administration (NASA) Earth Observing System (EOS) currently "produces a regular global estimate of gross primary productivity (GPP) and annual net primary productivity (NPP) of the entire terrestrial earth surface at 1-km spatial resolution, 150 million cells, each having GPP and NPP computed individually" (Running et al.. 2000). The MOD17A2/A3 User's Guide (Heinsch et al.. 2003) provides a description of the Gross and Net Primary Productivity estimation algorithms (MOD17A2/A3) designed for the MODIS1\* sensor.

The sample calculation results based on the MODI7A2/A3 algorithm are listed in Table 2.2. The NPPs for Asia Pacific. South America, and Europe, relative to North America, are shown in Fig. 2.17. The phenomenal net ecosystem productivity of Asia Pacific is 4.2 larger than that of North America. The South American ecosystems deliver 2.7 times more than their North American counterparts, and Europe just 0.85. It is no surprise then that the World Bank19, as well as agribusiness and logging companies - Archer Daniel Midlands (ADM). Bunge. Cargill. Monsanto. CFBC. Safbois. Sodefor. ITB. Trans-M. and many others - all have moved in force to plunder the most productive tropical regions of the world, see Fig. 2.18.

According 10 a MODIS-based calculation (Roberts and Wooster, 2007) of biomass burned in Africa in February and August 2004. prior to the fires shown here, the resulting carbon dioxide emissions were 120 and 160 million tonnes per month, respectively.

The final result of this global "end-game" of ecological destruction will be an unmitigated and lightcning-fast collapse of ecosystems protecting a large portion of" humanity.20

2.5.5 NPP in the US

The overall median values of net primary productivity may be converted to the higher heating value (HHV) of NPP in the US. see Fig. 2.19. In 2003. thus estimated net annual biomass production in the US was 5.3 Gt and its HHV was 90 EJ. One must be careful, however, because the underlying distributions of ecosystem productivity are different for each ecosystem and highly asymmetric. Therefore, lumping them together and using just one median value can lead to a substantial systematic error. For example, the lumped value of US NPP of 90 EJ. underestimates the overall 2003 estimate21 of 0.408 x 7444068 x 106 x 17 x 106 x 2.2 x 10"18 = 113EJ by some 20%.

To limit this error, one can perform a more detailed calculation based on the 16 classes of land cover listed in Table 2.2 in (Hum et al.. 2001). The MODIS-derived median NPPs are reported for most of these classes. The calculation inputs are shown in Table 2.3. Since the spatial set of land-cover classes cannot be easily mapped onto the administrative set of USDA classes of cropland, woodland, pastureland/rangeland. and forests. Hunt et al. (2001) provide an approximate linear mapping between these two sets, in the form of a 16x4 matrix of coefficients between 0 and 1.1 have lumped the land-cover classes somewhat differently (to be closer to USDA's classes), and the results are shown in Table 2.4 and Fig. 2.20.

The Cropland 4- Mosaic class here comprises die USDA's cropland, woodland, and some of the pasture classes. The Remote Vegetation class comprises some of the USDA's rangeland and pastureland classes. The USDA forest class is somewhat larger than here, as some of the smaller patches of forest, such as parks, etc.. are in the Mosaic class. Thus calculated 2003 US NPP is 118 EJ yr"1, 74 EJ yr"1 of above-ground (AG) plant construction and 44 EJ yr in root construction. In addition 12/74 = 17% of AG vegetation is in remote areas, not counting the remote forested areas. Note that my use of land-cover classes and their typical root-to-shoot ratios yields an overall result (118 EJ yr~') which is very similar to that derived by the Numerical Terradynamic Simulation Group {113 EJ yr-1).

Therefore, the DOE/USDA proposal to produce 130 billion gallons of ethanol from 1400 million tonnes of biomass (Perlack et a!., 2005) each year - and year-after-year-, would consume 32% of the remaining above-ground NPP in the US. see Fig. 2.20. if one assumes a 52% energy-efficiency of the conversion.~ At the current 26% overall efficiency of the corn-ethanol cycle (Patzek, 2006a), roughly 64% of all AG NPP in the US would have to be consumed to achieve this goal with zero harvest losses.23 To use more than half of all accessible above-ground plant growth in all forests, rangeland. pastureland and agriculture in the US to produce agrofuels would be a continental-scale ecologic and economic disaster of biblical proportions.24

2.6 Conclusions

I have shown that the Earth simply cannot produce the vast quantities of biomass we want to use to prolong our unsustainable lifestyles, while slowly committing suicide as a global human civilization.

In passing- I have noted that the "cellulosic biomass" refineries are very inefficient, currently impossible to scale, and incapable of ever catching up with the runaway need to feed one billion gasoline- and diesel-powered cars and trucks.

[NPP is net primary productivity – biomass produced by the earth annually]

# Elections

#### Obama’s ahead but it’s close

Cooper 10/25 Michael is a writer at the New York Times’ Caucus blog. “Has Romney’s Rise in Polls Stopped?” 2012, http://thecaucus.blogs.nytimes.com/2012/10/25/has-romneys-rise-in-polls-stopped/?gwh=20374120E0C2B79985262EFF8E8CD19D

A debate has been raging among polling analysts and commentators about whether Mitt Romney is still gaining ground, as he did after the first debate, or if his bounce has slowed or stalled. But while some Republicans say that they still have the wind at their backs, several polling analysts weighed in recently to argue that the data suggests there is no longer a Romney surge.¶ Mark Blumenthal, the senior polling editor of the Huffington Post and the founding editor of Pollster.com, wrote a piece this morning with the headline: “Presidential Polls Counter Romney Surge Myth.”¶ “While Romney gained significantly in the wake of the first presidential debate in early October,’’ he wrote, “the lack of a continuing trend over the past two weeks helps counter a theme in some campaign coverage that Romney’s support continues to ‘surge’ nationwide.”¶ Sam Wang, who analyzes state polls at the Princeton Election Consortium, wrote this week that the Mr. Obama’s plunge after the first debate had stopped with him still ahead, and delivered the following verdict: “Indeed the race is close, but it seems stable. For the last week, there is no evidence that conditions have been moving toward Romney. There is always the chance that I may have to eat my words — but that will require movement that is not yet apparent in polls.”¶ Nate Silver, who writes the FiveThirtyEight blog in The New York Times, wrote Thursday: “Mr. Romney clearly gained ground in the polls in the week or two after the Denver debate, putting himself in a much stronger overall position in the race. However, it seems that he is no longer doing so.”¶ With the race so close in so many places, it can be difficult to assess the true state of play. ¶ Most major national polls, with the exception of a few tracking polls, have shown the race to be essentially tied for months. Some polls in crucial swing states where Mr. Obama has been leading have tightened between the two candidates since the first debate, including Ohio, which is closer than it was a month ago. And now is the point where many voters pay more attention to the election, which can move the polls. But even with the proliferation of polls and the increased reliance on aggregated polls — lumping or averaging many polls together — it can be difficult to get a realistic picture on any given day in the closing weeks, given that some polls do not reach voters who use only cellphones, and many polls have struggled in an environment where fewer people want to respond to questions.

#### Advocating nuclear would be election suicide for Obama---he’s backing off it now

Levine 9/7 Gregg is a contributing editor and former managing editor of Firedoglake. “Obama Drops Nuclear from Energy Segment of Convention Speech,” 2012, http://capitoilette.com/2012/09/07/obama-drops-nuclear-from-energy-segment-of-convention-speech/

That Duke’s CEO thought to highlight efficiency is interesting. That President Obama, with his well-documented ties to the nuclear industry, chose not to even mention nuclear power is important. In the wake of Fukushima, where hundreds of thousands of Japanese have been displaced, where tens of thousands are showing elevated radiation exposure, and where thousands of children have thyroid abnormalities, no one can be cavalier about promising a safe harnessing of the atom. And in a world where radioisotopes from the breached reactors continue to turn up in fish and farm products, not only across Japan, but across the northern hemisphere, no one can pretend this is someone else’s problem. Obama and his campaign advisors know all this and more. They know that most industrialized democracies have chosen to shift away from nuclear since the start of the Japanese crisis. They know that populations that have been polled on the matter want to see nuclear power phased out. And they know that in a time of deficit hysteria, nuclear power plants are an economic sinkhole. And so, on a night when the president was promissed one of the largest audiences of his entire campaign, he and his team decided that 2012 was not a year to throw a bone to Obama’s nuclear backers. Obama, a consummate politician, made the decision that for his second shot at casting for the future, nuclear power is political deadweight.

#### That swings the election

Seattle Times 12"Not just the economy: Secondary issues may play role in election," 7/14, http://seattletimes.nwsource.com/html/nationworld/2018688463\_electionissues15.html

WASHINGTON — As the economy colors and polarizes voters' attitudes, the Election Day outcome for President Obama and Republican challenger Mitt Romney may be decided on the margins by narrower issues that energize small but crucial slivers of the population.¶ For three months, the economy by most measures has faltered. Yet the White House contest has remained locked in place, with the incumbent holding on to a slight national lead or in a virtual tie with his rival. Analysts from both parties have no doubt that absent a defining, unpredictable moment, the race will remain neck and neck until November.

#### Romney causes massive foreign backlash and nuclear wars globally

Bandow 12 Doug is a senior fellow at the Cato Institute. “Mitt Romney: The Foreign Policy of Know-Nothingism,” 5/15, <http://www.cato.org/publications/commentary/mitt-romney-foreign-policy-knownothingism>

Republican politicians continue to beat the war drums. All of this cycle’s GOP presidential contenders, save Rep. Ron Paul, charged President Barack Obama with weakness, indeed, almost treason. But the public isn’t convinced. The president who increased military spending, twice upped troop levels in Afghanistan, started his own war with Libya, talked tough to North Korea, loudly threatened Iran and Syria, and oversaw the hit on Osama bin Laden just doesn’t look like a wimp.¶ In fact, a recent Washington Post-ABC poll found that Americans prefer Barack Obama to Mitt Romney on international issues by 53 percent to 36 percent. Republican apparatchiks Karl Rove and Ed Gillespie nevertheless claim, “the president is strikingly vulnerable in this area,” but so far Romney is convincing only as a blowhard with a know-nothing foreign policy. Noted Jacob Heilbrunn of the National Interest, the GOP is “returning to a prescription that led to trillion-dollar wars in the Middle East that the public loathes.”¶ Romney’s overall theme is American exceptionalism and greatness, slogans that win public applause but offer no guidance for a bankrupt superpower that has squandered its international credibility. “This century must be an American century,” Romney proclaimed. “In an American century, America leads the free world and the free world leads the entire world.” He has chosen a mix of advisers, including the usual neocons and uber-hawks — Robert Kagan, Eliot Cohen, Jim Talent, Walid Phares, Kim Holmes, and Daniel Senor, for instance — that gives little reason for comfort. Their involvement suggests Romney’s general commitment to an imperial foreign policy and force structure. ¶ Romney is no fool, but he has never demonstrated much interest in international affairs. He brings to mind George W. Bush, who appeared to be largely ignorant of the nations he was invading. Romney may be temperamentally less likely to combine recklessness with hubris, but he would have just as strong an incentive to use foreign aggression to win conservative acquiescence to domestic compromise. This tactic worked well for Bush, whose spendthrift policies received surprisingly little criticism on the right from activists busy defending his war-happy foreign policy. ¶ The former Massachusetts governor has criticized President Obama for “a naked political calculation or simply sheer ineptitude” in following George W. Bush’s withdrawal timetable in Iraq and for not overriding the decision of a government whose independence Washington claims to respect. But why would any American policymaker want to keep troops in a nation that is becoming ever more authoritarian, corrupt, and sectarian? It is precisely the sort of place U.S. forces should not be tied down. ¶ In contrast, Romney has effectively taken no position on Afghanistan. At times he appears to support the Obama timetable for reducing troop levels, but he has also proclaimed that “Withdrawal of U.S. forces from Afghanistan under a Romney administration will be based on conditions on the ground as assessed by our military commanders.” Indeed, he insisted: “To defeat the insurgency in Afghanistan, the United States will need the cooperation of both the Afghan and Pakistani governments — we will only persuade Afghanistan and Pakistan to be resolute if they are convinced that the United States will itself be resolute,” and added, “We should not negotiate with the Taliban. We should defeat the Taliban.” ¶ Yet it’s the job of the president, not the military, to decide the basic policy question: why is the U.S. spending blood and treasure trying to create a Western-style nation state in Central Asia a decade after 9/11? And how long is he prepared to stay — forever? On my two trips to Afghanistan I found little support among Afghans for their own government, which is characterized by gross incompetence and corruption. Even if the Western allies succeed in creating a large local security force, will it fight for the thieves in Kabul? ¶ Pakistan is already resolute — in opposing U.S. policy on the ground. Afghans forthrightly view Islamabad as an enemy. Unfortunately, continuing the war probably is the most effective way to destabilize nuclear-armed Pakistan. What will Romney do if the U.S. military tells him that American combat forces must remain in Afghanistan for another decade or two in order to “win”? ¶ The ongoing AfPak conflict is not enough; Romney appears to desire war with Iran as well. No one wants a nuclear Iran, but Persian nuclear ambitiions began under America’s ally the Shah, and there is no reason to believe that the U.S. (and Israel) cannot deter Tehran. True, Richard Grenell, who briefly served as Romney’s foreign-policy spokesman, once made the astonishing claim that the Iranians “will surely use” nuclear weapons. Alas, he never shared his apparently secret intelligence about the leadership in Tehran’s suicidal tendencies. The Iranian government’s behavior has been rational even if brutal, and officials busy maneuvering for power and wealth do not seem eager to enter the great beyond. Washington uneasily but effectively deterred Joseph Stalin and Mao Zedong, the two most prolific mass murderers in history. Iran is no substitute for them. ¶ Romney has engaged in almost infantile ridicule of the Obama administration’s attempt to engage Tehran. Yet the U.S. had diplomatic relations with Hitler’s Germany and Stalin’s Russia. Washington came to regret not having similar contact with Mao’s China. Even the Bush administration eventually decided that ignoring Kim Jong-Il’s North Korea only encouraged it to build more nuclear weapons faster. ¶ Regarding Iran, Romney asserted, “a military option to deal with their nuclear program remains on the table.” Building up U.S. military forces “will send an unequivocal signal to Iran that the United States, acting in concert with allies, will never permit Iran to obtain nuclear weapons... Only when the ayatollahs no longer have doubts about America’s resolve will they abandon their nuclear ambitions.” Indeed, “if all else fails... then of course you take military action,” even though, American and Iranian military analysts warn, such strikes might only delay development of nuclear weapons. “Elect me as the next president,” he declared, and Iran “will not have a nuclear weapon.” ¶ Actually, if Tehran becomes convinced that an attack and attempted regime change are likely, it will have no choice but to develop nuclear weapons. How else to defend itself? The misguided war in Libya, which Romney supported, sent a clear signal to both North Korea and Iran never to trust the West. ¶ Iran’s fears likely are exacerbated by Romney’s promise to subcontract Middle East policy to Israel. The ties between the U.S. and Israel are many, but their interests often diverge. The current Israeli government wants Washington to attack Iran irrespective of the cost to America. Moreover, successive Israeli governments have decided to effectively colonize the West Bank, turning injustice into state policy and making a separate Palestinian state practically impossible. Perceived American support for this creates enormous hostility toward the U.S. across the Arab and Muslim worlds. ¶ Yet Romney promises that his first foreign trip would be to Israel “to show the world that we care about that country and that region” — as if anyone anywhere, least of all Israel’s neighbors, doesn’t realize that. He asserted that “you don’t allow an inch of space to exist between you and your friends and allies,” notably Israel. The U.S. should “let the entire world know that we will stay with them and that we will support them and defend them.” Indeed, Romney has known Israeli Prime Minister Benjamin Netanyahu for nearly four decades and has said that he would request Netanyahu’s approval for U.S. policies: “I’d get on the phone to my friend Bibi Netanyahu and say, ‘Would it help if I say this? What would you like me to do?’” Americans would be better served by a president committed to making policy in the interests of the U.S. instead. ¶ Romney’s myopic vision is just as evident when he looks elsewhere. For instance, he offered the singular judgment that Russia is “our number one geopolitical foe.” Romney complained that “across the board, it has been a thorn in our side on questions vital to America’s national security.” ¶ The Cold War ended more than two decades ago. Apparently Romney is locked in a time warp. Moscow manifestly does not threaten vital U.S. interests. Romney claimed that Vladimir “Putin dreams of ‘rebuilding the Russian empire’.” Even if Putin has such dreams, they don’t animate Russian foreign policy. No longer an ideologically aggressive power active around the world, Moscow has retreated to the status of a pre-1914 great power, concerned about border security and international respect. Russia has no interest in conflict with America and is not even much involved in most regions where the U.S. is active: Asia, the Middle East, and Latin America. ¶ Moscow has been helpful in Afghanistan, refused to provide advanced air defense weapons to Iran, supported some sanctions against Tehran, used its limited influence in North Korea to encourage nuclear disarmament, and opposes jihadist terrorism. This is curious behavior for America’s “number one geopolitical foe.” ¶ Romney’s website explains that he will “implement a strategy that will seek to discourage aggressive or expansionist behavior on the part of Russia,” but other than Georgia where is it so acting? And even if Georgia fell into a Russian trap, Tbilisi started the shooting in 2008. In any event, absent an American security guarantee, which would be madness, the U.S. cannot stop Moscow from acting to protect what it sees as vital interests in a region of historic influence. ¶ Where else is Russia threatening America? Moscow does oppose NATO expansion, which actually is foolish from a U.S. standpoint as well, adding strategic liabilities rather than military strengths. Russia strongly opposes missile defense bases in Central and Eastern Europe, but why should Washington subsidize the security of others? Moscow opposes an attack on Iran, and so should Americans. Russia backs the Assad regime in Syria, but the U.S. government once declared the same government to be “reformist.” Violent misadventures in Kosovo, Afghanistan, Iraq, and Libya demonstrate that America has little to gain and much to lose from another attempt at social engineering through war. If anything, the Putin government has done Washington a favor keeping the U.S. out of Syria. ¶ This doesn’t mean America should not confront Moscow when important differences arise. But treating Russia as an adversary risks encouraging it to act like one. Doing so especially will make Moscow more suspicious of America’s relationships with former members of the Warsaw Pact and republics of the Soviet Union. Naturally, Romney wants to “encourage democratic political and economic reform” in Russia — a fine idea in theory, but meddling in another country’s politics rarely works in practice. Just look at the Arab Spring. ¶ Not content with attempting to start a mini-Cold War, Mitt Romney dropped his nominal free-market stance to demonize Chinese currency practices. He complained about currency manipulation and forced technology transfers: “China seeks advantage through systematic exploitation of other economies.” ¶ On day one as president he promises to designate “China as the currency manipulator it is.” Moreover, he added, he would “take a holistic approach to addressing all of China’s abuses. That includes unilateral actions such as increased enforcement of U.S. trade laws, punitive measures targeting products and industries that rely on misappropriations of our intellectual property, reciprocity in government procurement, and countervailing duties against currency manipulation. It also includes multilateral actions to block technology transfers into China and to create a trading bloc open only for nations genuinely committed to free trade.” ¶ Romney’s apparent belief that Washington is “genuinely committed to free trade” is charming nonsense. The U.S. has practiced a weak dollar policy to increase exports. Washington long has subsidized American exports: the Export-Import Bank is known as “Boeing’s Bank” and U.S. agricultural export subsidies helped torpedo the Doha round of trade liberalization through the World Trade Organization. ¶ Of course, Beijing still does much to offend Washington. However, the U.S. must accommodate the rising power across the Pacific. Trying to keep China out of a new Asia-Pacific trade pact isn’t likely to work. America’s Asian allies want us to protect them — no surprise! — but are not interested in offending their nearby neighbor with a long memory. The best hope for moderating Chinese behavior is to tie it into a web of international institutions that provide substantial economic, political, and security benefits. ¶ Beijing already has good reason to be paranoid of the superpower which patrols bordering waters, engages in a policy that looks like containment, and talks of the possibility of war. Trying to isolate China economically would be taken as a direct challenge. Romney would prove Henry Kissinger’s dictum that even paranoids have enemies. ¶ Naturally, Romney also wants to “maintain appropriate military capabilities to discourage any aggressive or coercive behavior by China against its neighbors.” However, 67 years after the end of World War II, it is time for Beijing’s neighbors to arm themselves and cooperate with each other. Japan long had the second largest economy on earth. India is another rising power with reason to constrain China. South Korea has become a major power. Australia has initiated a significant military build-up. Many Southeast Asian nations are constructing submarines to help deter Chinese adventurism. Even Russia has much to fear from China, given the paucity of population in its vast eastern territory. But America’s foreign-defense dole discourages independence and self-help. The U.S. should step back as an off-shore balancer, encouraging its friends to do more and work together. It is not America’s job to risk Los Angeles for Tokyo, Seoul, or Taipei. ¶ Romney similarly insists on keeping the U.S. on the front lines against North Korea, even though all of its neighbors have far more at stake in a peaceful peninsula and are able to contain that impoverished wreck of a country. The Romney campaign proclaims: “Mitt Romney will commit to eliminating North Korea’s nuclear weapons and its nuclear-weapons infrastructure.” Alas, everything he proposes has been tried before, from tougher sanctions to tighter interdiction and pressure on China to isolate the North. What does he plan on doing when Pyongyang continues to develop nuclear weapons as it has done for the last 20 years? ¶ The American military should come home from Korea. Romney complained that the North’s nuclear capability “poses a direct threat to U.S. forces on the Korean Peninsula and elsewhere in East Asia.” Then withdraw them. Manpower-rich South Korea doesn’t need U.S. conventional support, and ground units do nothing to contain North Korea’s nuclear ambitions. Pull out American troops and eliminate North Korea’s primary threat to the U.S. Then support continuing non-proliferation efforts led by those nations with the most to fear from the North. That strategy, more than lobbying by Washington, is likely to bring China around. ¶ Romney confuses dreams with reality when criticizing President Obama over the administration’s response to the Arab Spring. “We’re facing an Arab Spring which is out of control in some respects,” he said, “because the president was not as strong as he needed to be in encouraging our friends to move toward representative forms of government.” Romney asked: “How can we try and improve the odds so what happens in Libya and what happens in Egypt and what happens in other places where the Arab Spring is in full bloom so that the developments are toward democracy, modernity and more representative forms of government? This we simply don’t know.” ¶ True, the president doesn’t know. But neither does Mitt Romney. The latter suffers from the delusion that bright Washington policymakers can remake the world. Invade another country, turn it into a Western-style democracy allied with America, and everyone will live happily every after. But George W. Bush, a member of Mitt Romney’s own party, failed miserably trying to do that in both Afghanistan and Iraq. The Arab Spring did not happen because of Washington policy but in spite of Washington policy. And Arabs demanding political freedom — which, unfortunately, is not the same as a liberal society — have not the slightest interest in what Barack Obama or Mitt Romney thinks. ¶ Yet the latter wants “convene a summit that brings together world leaders, donor organizations, and young leaders of groups that espouse” all the wonderful things that Americans do. Alas, does he really believe that such a gathering will stop, say, jihadist radicals from slaughtering Coptic Christians? Iraq’s large Christian community was destroyed even as the U.S. military occupied that country. His summit isn’t likely to be any more effective. Not everything in the world is about Washington. ¶ Which is why Romney’s demand to do something in Syria is so foolish. Until recently he wanted to work with the UN, call on the Syrian military to be nice, impose more sanctions, and “increase the possibility that the ruling minority Alawites will be able to reconcile with the majority Sunni population in a post-Assad Syria.” Snapping his fingers would be no less effective. ¶ Most recently he advocated arming the rebels. But he should be more cautious before advocating American intervention in another conflict in another land. Such efforts rarely have desirable results. Iraq was a catastrophe. Afghanistan looks to be a disaster once American troops come home. After more than a decade Bosnia and Kosovo are failures, still under allied supervision. Libya is looking bad. ¶ Even without U.S. “help,” a full-blown civil war already threatens in Syria. We only look through the glass darkly, observed the Apostle Paul. It might be best for Washington not to intervene in another Muslim land with so many others aflame. ¶ Despite his support for restoring America’s economic health, Romney wants to increase dramatically Washington’s already outsize military spending. Rather than make a case on what the U.S. needs, he has taken the typical liberal approach of setting an arbitrary number: 4 percent of GDP. It’s a dumb idea, since America already accounts for roughly half the globe’s military spending — far more if you include Washington’s wealthy allies — and spends more in real terms than at any time during the Cold War, Korean War, or Vietnam War, and real outlays have nearly doubled since 2000. By any normal measure, the U.S. possesses far more military resources than it needs to confront genuine threats. ¶ What Romney clearly wants is a military to fight multiple wars and garrison endless occupations, irrespective of cost. My Cato colleague Chris Preble figured that ¶ Romney's 4 percent gimmick would result in taxpayers spending more than twice as much on the Pentagon as in 2000 (111 percent higher, to be precise) and 45 percent more than in 1985, the height of the Reagan buildup. Over the next ten years, Romney's annual spending (in constant dollars) for the Pentagon would average 64 percent higher than annual post-Cold War budgets (1990-2012), and 42 percent more than the average during the Reagan era (1981-1989). ¶ If Mitt Romney really believes that the world today is so much more dangerous than during the Cold War, he should spell out the threat. He calls Islamic fundamentalism, the Arab Spring, the impact of failed states, the anti-American regimes of Cuba, Iran, North Korea, and Venezuela, rising China, and resurgent Russia “powerful forces.” It’s actually a pitiful list — Islamic terrorists have been weakened and don’t pose an existential threat, the Arab Spring threatens instability with little impact on America, it is easier to strike terrorists in failed states than in nominal allies like Pakistan and Saudi Arabia, one nuclear-armed submarine could vaporize all four hostile states, and Russia’s modest “resurgence” may threaten Georgia but not Europe or America. Only China deserves to be called “powerful,” but it remains a developing country surrounded by potential enemies with a military far behind that of the U.S. ¶ In fact, the greatest danger to America is the blowback that results from promiscuous intervention in conflicts not our own. Romney imagines a massive bootstrap operation: he wants a big military to engage in social engineering abroad which would require an even larger military to handle the violence and chaos that would result from his failed attempts at social engineering. Better not to start this vicious cycle. ¶ America faces international challenges but nevertheless enjoys unparalleled dominance. U.S. power is buttressed by the fact that Washington is allied with every industrialized nation except China and Russia. America shares significant interests with India, the second major emerging power; is seen as a counterweight by a gaggle of Asian states worried about Chinese expansion; remains the dominant player in Latin America; and is closely linked to most of the Middle East’s most important countries, such as Israel, Saudi Arabia, Egypt, Jordan, and Iraq. If Mitt Romney really believes that America is at greater risk today than during the Cold War, he is not qualified to be president. ¶ In this world the U.S. need not confront every threat, subsidize every ally, rebuild every failed state, and resolve every problem. Being a superpower means having many interests but few vital ones warranting war. Being a bankrupt superpower means exhibiting judgment and exercising discretion. ¶ President Barack Obama has been a disappointment, amounting in foreign policy to George W. Bush-lite. But Mitt Romney sounds even worse. His rhetoric suggests a return to the worst of the Bush administration. The 2012 election likely will be decided on economics, but foreign policy will prove to be equally important in the long-term. America can ill afford another know-nothing president

# Solvency

#### Their article acknowledges this---Obama’s initial budget request was a low-ball offer to set the goalposts, which could be moved later---the administration clearly didn’t want to reduce funding for advanced nuclear designs

Eric P. Loewen 12, Ph.D., President, American Nuclear Society, 3/30/12, House Appropriations Subcommittee on Energy and Water Development On the FY 2013 Energy and Water Development Appropriations Bill, http://ansnuclearcafe.org/2012/04/02/loewen-submits-testimony/

We are puzzled however by the President’s FY 2013 budget request for the Department of Energy Office of Nuclear Energy (DOE NE), which is clearly insufficient to maintain progress on the administration’s own announced priorities.

Administration’s budget documents show a net increase of 0.7% over FY 2012, which on the surface would seem to be a reasonable request given the current fiscal pressures. Upon closer inspection, however, the administration proposes moving $95 million in funding for “Idaho Sitewide Safeguards and Security” into the main DOE NE budget from Other Defense Activities account. Without this clever piece of accounting, the actual FY 13 DOE NE budget would be cut by 11.7%, while the overall funding level for DOE would increase by 3.2%.

It is apparent that the president’s budget request for DOE NE is more a product of internal budgetary “goal posting” than a deliberate attempt to reduce the scope of the administration’s initiatives in nuclear energy science and technology.

#### Their evidence establishes a threshold of sufficiency for the status quo solving the case---it explicitly argues for fiscal-year 2013 funding for the overall DOE nuclear energy program to stay constant and unchanged from 2012 levels---this sets the bar for what we have to prove very low---we only have to win that the actual 2013 budget will meet or exceed 2012 budget levels

Eric P. Loewen 12, Ph.D., President, American Nuclear Society, 3/30/12, House Appropriations Subcommittee on Energy and Water Development On the FY 2013 Energy and Water Development Appropriations Bill, http://ansnuclearcafe.org/2012/04/02/loewen-submits-testimony/

The ANS believes it is extremely important to maintain funding for the DOE NE at consistent levels, and urges the subcommittee to base its FY 2013 recommendations on FY 2012 enacted levels. As such, our specific program recommendations for DOE NE assume “flat funding” in FY 2013.

#### Their ev says the Advanced Reactor Concepts program, which houses HTGR research, should be funded at unchanged 2012 levels---there weren’t actual cuts, just proposed ones

Eric P. Loewen 12, Ph.D., President, American Nuclear Society, 3/30/12, House Appropriations Subcommittee on Energy and Water Development On the FY 2013 Energy and Water Development Appropriations Bill, http://ansnuclearcafe.org/2012/04/02/loewen-submits-testimony/

The Advanced Reactor Concepts program should be funded at the FY 2012 enacted levels. ANS recognizes that the administration has de-prioritized the development of socalled Generation IV reactor designs. However, its proposed 43% cut in funding for the Advanced Reactor Concepts program will essentially relinquish US global leadership in an American technology and throw away previous US investments. Forgoing this leadership directly impacts our ability to promote US safety and nonproliferation standards around the world for these technologies.

#### And their ev says the Next Generation Nuclear Plant project should be funded at the level built into the statute that created it

Eric P. Loewen 12, Ph.D., President, American Nuclear Society, 3/30/12, House Appropriations Subcommittee on Energy and Water Development On the FY 2013 Energy and Water Development Appropriations Bill, http://ansnuclearcafe.org/2012/04/02/loewen-submits-testimony/

The Next Generation Nuclear Plant project should be funded at its authorized amount in EPAC of 2005 in FY 2013. ANS believes that DOE should fund the NGNP project for success and near-term results rather than settle for a slower pace of licensing “framework” activities. Developing a licensing “framework” does not establish technology leadership, rather it concrete foundations of this first-of-kind project that will establish the US as technology leaders.

#### The actual status of HTGR research is exactly what their ev says is necessary:

#### The House passed a budget that increases overall DOE nuclear energy funding, including reversing the proposed budget cuts in the only areas their ev establishes as important for their aff

Mike Simpson 12, U.S. Representative (R-ID), 6/6/12, “Idaho Congressman says Energy Department funding bill restores Obama Administration cuts, allows progress to continue on nuclear energy research and development;,” Congressional Documents and Publications, p. lexis

Idaho Congressman Mike Simpson today praised the work of the House Appropriations Subcommittee on Energy and Water Development in crafting a bill that reverses Obama Administration cuts to nuclear energy programs and continues progress toward the development of new nuclear technologies, including those under development at Idaho National Laboratory. Simpson is a senior member of the Subcommittee, serving as one of its members for over nine years.

"I am very pleased that the Subcommittee and the House of Representatives have once again demonstrated their support for the development of nuclear energy and provided the resources necessary to continue our nation's progress on new and promising nuclear technologies," said Congressman Simpson. "Idaho National Laboratory plays a vital national and international role in leading the development of new nuclear technologies, and this bill will help maintain and expand that role in the future. The House had to make some very difficult choices about where to focus limited taxpayer resources, and I am very grateful for the confidence my colleagues have shown for nuclear energy in this bill."

The fiscal year 2013 Energy and Water Development Appropriations bill includes $765 million for the DOE's Office of Nuclear Energy, level funding with FY2012 and $89.9 million above the Obama Administration's FY2013 request when adjusted for INL's Safeguards and Security funding. Nuclear energy research and development programs that receive funding within the $765 million allocation include:

\* The Idaho Facilities Management account, which covers infrastructure maintenance and improvement at Idaho National Laboratory, received $162 million which is $10 million above the President's request;

\* The Next Generation Nuclear Plant program, a high-temperature gas-cooled reactor designed to allow nuclear power to provide process heat for industrial applications, received $50 million which is $30 million above the President's request;

\* The Nuclear Energy Enabling Technologies program, including the Advanced Test Reactor National Scientific User Facility at the INL, received $75 million which is $9.7 million above the President's request;

\* Reactor Concepts Research, Development and Demonstration received $126 million which is $53 million above the President's request. This category includes $28.7 million for Small Modular Reactor Advanced Concepts Research and Development and $25 million for the Light Water Reactor Sustainability Program, which promotes the continued safe operation of America's existing nuclear reactors;

\* Integrated University Programs received $5 million.

In addition, the bill contains $93.35 million for Idaho National Laboratory's Safeguards and Security function which was moved out of the Office of Nuclear Energy account and into the Other Defense Activities account.

Beyond funding for the Office of Nuclear Energy, the bill includes $399.6 million for cleanup activities associated with the Idaho Cleanup Project and the Advanced Mixed Waste Treatment Project co-located on the Idaho desert with Idaho National Laboratory. The funding level of $399.6 million is level with the President's request and $14.9 million above the FY2012 funding level of $384.7 million.

Overall, the Energy and Water Development Appropriations bill provides $32.1 billion dollars for the functions of the Department of Energy, the Army Corps of Engineers, the Bureau of Reclamation and a number of independent agencies, including the Nuclear Regulatory Commission and the Bonneville Power Administration. This level of funding represents a reduction of $965 million below the President's request.

"I am pleased this bill lays out a clear, consistent and logical approach to improving our nation's energy independence by understanding the role all energy technologies play in our energy mix and by appreciating the role nuclear energy plays in particular," said Simpson. "This funding restores cuts to important reactor programs and ensures INL remains at the forefront of nuclear energy research and development both nationally and internationally."

The bill was approved today by the House of Representatives with a final vote of 255-165 and now awaits negotiations with the Senate once its bill is finalized.

#### The Senate appropriations committee marked up their version of the bill with even more funding for DOE nuclear research---it’s $31 million above fiscal 2012 levels

SCA 12 – Senate Committee on Appropriations, 4/24/12, Summary: FY13 Energy and Water Development Appropriations Bill, http://www.appropriations.senate.gov/news.cfm?method=news.view&id=eaa626fc-9ba7-4477-ae48-25767c9ae814

The U.S. Senate Appropriations Subcommittee on Energy and Water Development today approved fiscal year 2013 funding legislation that totals $33.361 billion, which is $373 million below the fiscal year 2012 enacted level. The bill funds the Army Corps of Engineers, the Department of Energy (DOE), and the Bureau of Reclamation, which provide critical investments in water infrastructure, clean and alternative energy sources, and national security activities related to nuclear weapons modernization and preventing nuclear terrorism.

U.S. Senator Dianne Feinstein (D-Calif.), Chairman of the Energy and Water Development Appropriations Subcommittee, issued the following statement:

"This bill makes responsible investments in critical water infrastructure projects, clean energy technologies and nonproliferation and nuclear weapons programs. It allows the Corps of Engineers and the Bureau of Reclamation to fulfill their public safety responsibilities around the country while safeguarding and modernizing our nuclear weapon stockpile. The bill adds a limited provision to begin addressing our lack of policy for long-term storage of spent nuclear fuel and high-level radioactive waste, providing the Department of Energy with the authority to initiate a pilot program for a consolidated storage facility."

Highlights of the fiscal year 2013 Energy and Water Development Appropriations bill:

Department of Energy (DOE)-The bill provides $27.128 billion for DOE, which is $1.380 billion above fiscal year 2012. The subcommittee's priority is to advance clean energy technologies and invest in research that will spur future economic growth.

The Advanced Research Projects Agency-Energy (ARPA-E)-The bill provides $312 million, which is $37 million above fiscal year 2012, to accelerate commercialization of future energy technologies that can reduce the nation's dependence on foreign oil and tackle carbon emissions.

Office of Science-The bill provides $4.909 billion, which is $35 million above fiscal year 2012, for basic research. The highest priorities are materials and biological research to focus on breakthroughs in energy applications and computing to develop the next-generation high performance systems.

Energy Efficiency and Renewable Energy-The bill provides $1.98 billion, which is $160 million more than fiscal year 2012, to advance solar, biomass, and vehicle technologies.

Electricity and Energy Reliability-The bill provides $143 million, which is $4 million more than fiscal year 2012, to support energy integration into the electric transmission grid. The bill fully funds a new Electricity Systems Hub to accelerate efforts to modernize the electric transmission and distribution systems.

Nuclear Energy-The bill provides $793 million, which is $31 million above fiscal year 2012 for nuclear energy. The bill fully funds the small modular reactors program to support design certification and licensing and begins to implement the recommendations of the Blue Ribbon Commission to address safe long-term storage of commercial spent nuclear fuel and defense high level waste.

#### Their Gibbs evidence is about a letter from the Energy Secretary saying that given the administration’s budget request, the NGNP would stop doing design work---obviously all our arguments about the budget resolve that---and design work is still ongoing

Gregory Jennings 12, NGNP Planning and Controls, 1/9/12, “NGNP Integrated Schedule Development Plan,” Document ID: PLN-2924, Revision ID: 1

1. INTRODUCTION

The Next Generation Nuclear Plant (NGNP) Project is currently developing an integrated planning schedule that will account for major activities from the various technology development plans within R&D, the recently identified licensing path forward, and the engineering and design work performed during FY 2007 and FY 2008. Each of these areas had generated a schedule to meet their individual goals using technical requirements and acquisition strategies, current at the time of their respective development.

2. DESCRIPTION

The resulting integrated planning schedule is not resource loaded, yet logically ties technical and programmatic activities, and has already identified conflicts and interdependencies not previously recognized. This has also promoted more frequent interaction between the responsible NGNP technical staff to resolve these issues and to develop preventive measures to avoid such conflicts. The current integrated planning schedule contains different levels of granularity, depending on the maturity of each technical area. Fuels Development and Qualification is the most mature area and has a great deal of detail in terms of scope and sequence. High Temperature Materials, however, is still identifying performance requirements—highly dependent on reactor type and configuration—to define the necessary activities to support startup date of 2021. As the technologies mature and the project obtains CD-1 approval (or equivalent maturity), it will continue to be revised to keep it relevant and current.

3. ASSUMPTIONS

The following assumptions were made in the development of the schedule in Appendix A and may differ from those assumptions previously made in the development of earlier schedules. Some of these assumptions are fixed duration (time to review COL), some are milestones dates (selection of a design), and some are alluding to the order in which the corresponding activities need to take place, relative to other activities. The list of assumptions below does not represent a complete set and should not be interpreted as having considered and excluded some assumptions which NGNP has no knowledge as of yet.

 This schedule is not constrained by Fiscal Year Funding.

 Project schedule includes DOE 413.3 CD 1/2/3/4 milestones and deliverables based on those milestones as required by DOE.

 Critical path is calculated in this planning schedule as any activity with less than 30 days total float.

 This schedule assumes a 5 day work week, with typical holidays off.

 Schedule reflects the generation of an Engineering, Procurement, Construction (EPC) scope of work at the end of conceptual design for release at the start of preliminary design.

 The Hydrogen Production System (HPS) is a separate scope of work and Request for Proposal

(RFP) issued at preliminary design. (separate from EPC)

 The reactor type selection is considered a Department of Engery (DOE) decision milestone.

 Conceptual design will include both reactor designs until reactor decision milestone is met.

 Completion of preliminary design feeds the licensing process (PSID).

 Conceptual safety analysis work is based on the Westinghouse Electric Company (WEC) Conceptual Design Plan schedule.

 During conceptual design, draft procurement specifications for the Reactor Pressure Vessel (RPV) and Intermediate Heat Exchanger (IHX) will be issued to the fabricator to begin the longlead procurement process.

 Baseline graphite Code Case review/approval and acceptance reflects beginning-of-life material properties.

 Graphite irradiation/creep (remainder-of-life) Code Case development will proceed with final R&D data input to the final Code Case as confirmatory data.

 High Temperature Metals preparation will work current and new issues for Hight Tempature Gas Reactor (HTGR) design-by-analysis rules and revise Subsection NH. Also, to avoid acceptance delays, pursue American Society of Mechanical Engineers (ASME) Committee partial acceptance of revised Subsection NH without full material data. Final acceptance then depends only on acceptance of remaining materials data, not the entire Code Case.

 Early Site Permit (ESP) Pre-application reviews with Nuclear Regulatory Commission (NRC) staff start in 2009.

 Site is selected by April 2010.

 The ESP requires 2 years to develop application (includes majority of field work).

 The NRC application acceptance review of the ESP requires 14 months.

 The Resolution of public comments on draft EIS takes 10 months.

 The NRC staff safety review of the ESP requires 15 months.

 Resolution of draft Safety Evaluation Report (SER) comments and Advisory Committee on Reactor Safegaurds (ACRS) review requires 5 months.

 Public hearing process for ESP requires 13 months.

 PSID development for the Combined Operating License (COL) requires 15 months.

 Application development for the COL requires 31 months.

 AGR-2 irradiation test results are adequate for COL development and submittal to the NRC.

 AGR-2, 3/4 and 5/6 PIE completion not required for COL submittal; assumed that these tasks will be finished prior to completion of the NRC technical review.

 AGR-7 and AGR-8 will be necessary during commercial operations (Post Operating License) Proof Test for Operations.

 AGR-2, 3, 4, 5, 6 PIE data will feed the final topical report.

 NRC technical review of the COL takes 33 months.

 Public hearing process of the COL takes 12 months.

 NRC wil accept preliminary data without being codified.

 AGC-5 and AGC-6 are not needed for the NGNP’s 800 degree C. outlet temperature. AGC-5 and

AGC-6 will be needed for follow-on reactors with higher outlet temperatures.

 Advanced Gas Reactor (AGR) and Advanced Graphite Capsule (AGC) timelines are constrained by ATR availability.

 All experiments are successful, with no upset to planned acquisitions.

 Open items raised during the NRC review period that require plant operation to resolve will be addressed during the initial operating period.

 The receipt of a COL for NGNP will not necessarily result in certifying a nuclear system design appropriate for commercial operation. Additional effort to certify an HTGR nuclear system design for commercial application will be required.

 The schedule for development, design, construction, commissioning, and operation of the hydrogen plant for NGNP is based on the planning for the high-temperature electrolysis process.

 The design, construction and commissioning of the Component Test Facility (CTF) will be ready for component testing to support design and construction of NGNP and NRC certification of the nuclear system design(s).

#### The status quo resolves the entire aff---the NGNP has chosen a HTGR design in partnership with private companies, it’ll be built successfully now

NEI 10-3 – Nuclear Engineering International, “Gen IV - Power plant design - A steam cycle HTGR,” 10/3/12, p. 29

AREVA's steam cycle high-temperature gas-cooled reactor design adopts lower temperatures than other HTGRs in an effort to make nearer-term deployment a more realistic possibility. This design was recently taken up by the US NGNP Alliance.

AREVA's Steam Cycle High Temperature Gas-Cooled Reactor (SC-HTGR) is a small, modular, graphite-moderated, helium-cooled, high-output-temperature reactor with a nominal thermal power of 625 MWt. This reactor couples proven gas reactor technology with a modular deployment strategy to provide an effective match with a range of potential end-user industrial processes.

The motivation for development and deployment of the SC-HTGR is based on the need to reduce dependence on fossil fuels. LWRs and other renewables provide a significant fraction of electricity production, but electricity accounts for less than half of the total energy economy. Process heat and transportation fuels are almost completely dependent on fossil fuels. Deployment of HTRs, with their higher operating temperatures and flexible energy-delivery options, would provide a path to significantly impact this broad segment of the energy market with environmental, economic, and energy security benefits.

With its unique safety characteristics, the SC-HTGR affords the opportunity to locate the reactor near to the end-user's industrial facility while maintaining an enhanced level of overall safety.

The SC-HTGR design concept grew out of earlier work at AREVA (the ANTARES Project) and work supported by the US Department of Energy (early Next Generation Nuclear Plant designs) which utilized very high temperature reactor (VHTR) technology, that is, gas reactors with outlet temperatures approaching 900 deg to 1000 deg C. Two main considerations drove development of the SC-HTGR design. First, the VHTR designs require significant development of high-temperature materials, most notably ceramics, which have very long implementation timelines. This would significantly delay deployment of the technology. Secondly, market studies indicated a significant potential need for more moderate process heat-delivery systems such as high-temperature steam. The SC-HTGR evolved to address these factors and is envisioned as an excellent first step to near-term deployment of nuclear technology into the process-heat energy sector. Licensing experience and operational data gained from the SC-HTGR will benefit the next evolution of gas reactor technology, potentially into the VHTR arena.

The SC-HTGR has been selected by the NGNP Industry Alliance to be the base technology for its ongoing efforts to design, construct and operate the Next Generation Nuclear Plant in the US. The goal of the NGNP Alliance is to provide first-of-a-kind design and licensing experience to help foster development and deployment of a fleet of advanced reactors to help meet future US energy demand.

The design is currently at the early conceptual design phase. Commencement of the full design programme is awaiting commercial negotiations amongst and between the NGNP Industry Alliance, the US DOE (NGNP Project), and other potential investors.

Current development and testing activities being conducted through the US DOE Advanced Gas Reactor programme are aimed at fine-tuning the design and manufacture of fuel for the SC-HTGR and quantifying/qualifying its performance under operational and accident conditions. While the AGR programme is still in progress, preliminary results have been very favourable. The completion of the fuel quantification and qualification programme is integral to development of a persuasive safety case to present to the US Nuclear Regulatory Commission.

The reactor concept assumes completion of the US DOE Advanced Gas Reactor fuel development programme as well as the Advanced Graphite Creep graphite characterization and irradiation programme. It will also take advantage of the NRC-sponsored High Temperature Test Facility work being developed at Oregon State University.

#### This solves every internal link to the aff---the Areva HTGR will be deployed soon, spills over to international cooperation and exports, and resolves any outstanding problems with the program

MPS 12 – Modern Power System, “Nuclear Power: Small modular reactors.,” 6/7/12, p. lexis

The HTR concept proposed by Areva and now selected by the Next Generation Nuclear Plant Industry Alliance in the USA for further development avoids the exotic, eg helium Brayton direct cycle - employing a steam cycle instead - and adopts lower temperatures than were being a considered a few years ago. This can be seen as something of a step backwards in technology terms. But the aim is to try to make nearer term deployment a more realistic possibility.

The Next Generation Nuclear Plant Industry Alliance - a US based grouping of companies interested in promoting, developing and commercialising high temperature gas cooled reactor (HTGR) technology, with a focus on process heat applications (petrochemicals, oil recovery, synfuel production) as well as power - has announced that it has selected Areva's HTGR technology as "the optimum design for next generation nuclear power plants."

The Alliance describes its role as providing "a forum and focus to communicate industry needs and requirements" and it works in concert with the Idaho National Laboratory and others "to seek out and promote industrial uses for HTGR technologies within the United States, North America and other continents around the world." Members of the Alliance are: ConocoPhillips, Dow, Entergy, GrafTech International, Petroleum Technology Alliance Canada, SGL Group, Technology Insights, Toyo Tanso, Westinghouse and Areva itself. Entergy has assumed the role of applicant for the HTGR pre-application and licensing activities for the Alliance in response to Nuclear Regulatory Commission guidelines (eg, as set out in NRC Regulatory Issue Summary, 2011-02 Rev 1 - "Licensing Submittal Information and Design Development Activities for Small Modular Reactor Designs").

The Alliance sees the process heat sector as important because it is currently totally dependent on fossil fuels, and is focused on the HTGR because existing light water reactor technology is not well suited to the non-power energy markets.

Areva's proposed technology uses a 625 MWt "prismatic" block core (as opposed to pebble bed) with helium cooling coupled to a steam cycle (main steam temperature of 566 degC) via an intermediate heat exchanger (rather than a "direct" helium Brayton cycle, in which the helium itself is the working fluid driving a turbine). It was decided to adopt a steam cycle in the interests of reducing development lead times and associated risks.

The proposed Areva technology has a reactor outlet temperature of 750 degC, providing sufficient heat to achieve steam temperatures in the range 400-550 degC for applications such as oil refinery distillation and chemical processing.

At temperatures above about 750 degC the materials challenges become more significant and so do the costs, which is why the NGNPA's current roadmap has opted for the lower temperature route.

The US Energy Policy Act of 2005 called for development, construction, and operation of a prototype high temperature gas cooled reactor by 2021. US DoE set up a project office at the Idaho National Laboratory that included some of the R&D activities. Based on a request for proposals, DoE selected three firms to conduct design and engineering studies: General Atomics; Westinghouse; and Areva. General Atomics (interestingly not a member of NGNPA) proposed their Gas-Turbine Modular Helium Reactor (GT-MHR), which also employs a prismatic core, but allied to a helium Brayton direct cycle, while the Westinghouse proposal was based on the Pebble Bed Modular Reactor, drawing on recent development work carried out in South Africa, but now abandoned.

Both the Idaho lab and the NGNP Alliance determined that the only practical differentiation among the designs is tied to capital costs. The Alliance said the prismatic design offers a 30% cost savings over one using pebble bed technology.

The NGNP Alliance is developing a regulatory strategy to identify key issues related to getting a licence from the NRC. The combination of licensing and building a first-of-a-kind unit means it would take at least 10-12 years to get a new HTGR operating at a customer site.

Areva envisions that the HTGR will be installed at customer suites in clusters of up to four units. It estimates that the total cost, including R&D, for the first unit would be about $4 billion, but the "nth unit" would have actual construction costs closer to about $1 billion, and supply process heat at about $6-10/million Btu.

Through its predecessor companies Areva has been involved in HTGR development for many years, and in a variety of technologies. Through its joint venture with Siemens, Framatome-ANP, it inherited the technologies developed by Interatom in the 1960s and 1970s and the Modul concept of the 1980s, the origin of all modular high temperature gas cooled reactor concepts.

Framatome also collaborated with GA in the 1980s, and in the 1990s worked with them on the GT-MHR, along with Russian Institutes and Fuji Electric, which provided insights into the challenges posed by the direct cycle. On the strength of this experience, Framatome-ANP in the early 2000s or thereabouts decided to go for an indirect combined cycle concept. This employed a helium primary loop coupled to a secondary, predominantly nitrogen, loop via intermediate heat exchanger. The idea was to employ "conventional" combined cycle technology in this secondary loop, ie Brayton cycle plus Rankine bottoming cycle. Called ANTARES, or the Framatome-ANP VHTR, with a reactor outlet temperature of about 950 degC, it was envisaged as being suitable for hydrogen production and power generation applications.

In the Areva concept selected by NGNPA, which Areva calls a "steam-cycle HTR" or "near-term HTR", the Brayton cycle is dropped altogether, and temperatures are reduced, becoming an HTR rather than a VHTR, the motivation being to increase the prospects for industrial deployment in the nearer term by reducing development risks, for example those arising from the intermediate heat exchanger and the higher core outlet temperatures, while retaining a longer term aspiration to develop a VHTR in the future.

The new approach, as shown in Table 1, "partitions key risk elements between the near-term and long-term phases of the programme, thereby reducing the risk for each phase, and greatly reducing the overall programme risk", according L J Lommers et al, "Areva HTR concept for near-term deployment", Proceedings of HTR 2010, Prague, October 2010.

Table 2 provides some basic data for this Areva steam-cycle (near-term) HTR.

The steam-cycle approach minimises the need for advanced materials development and builds directly on experience to date (albeit rather limited) with operating HTGR plants, all of which have used a steam cycle configuration rather than a direct helium Brayton cycle. The latter brings considerable advantages to the HTGR but experience to date is very limited. Perhaps the most significant facility yet built to employ a direct helium Brayton cycle was the 50 MW Oberhausen 2 demonstration plant in Germany, which operated between 1975 and 1987 as a cogeneration plant with fossil fuel as the heat source.

# INL Adv

Colonization not feasible – reproduction difficulties would make it impossible

MacDonald ‘8

Fiona MacDonald, staff writer, The Metro, Cambridge University “Sex in space could be out of this world,” 20th August, 2008 http://www.metro.co.uk/lifestyle/272319-sex-in-space-could-be-out-of-this-world

Nasa is silent on the issue, beyond the curt: 'We don't study sexuality in space.' Yet mixed-sex crews have been in space for more than 20 years, with a married couple flying on a US shuttle in 1992. Rumours abound that the Russians have studied 'human docking procedures' in Earth's orbit. Couple kissing space Missionary to Mars? But sex in outer space could be trickier than you think 'When female astronauts went up to the Mir space station, there were stories circulating in the former Soviet Union that astronauts did have sex in space - which were never denied,' says Will Whitehorn, president of Virgin Galactic. Possibly problematic Richard Branson's space tourism venture is due to start test flights this year. 'We've already had a number of inquiries from people about whether they could be the first to have sex in space,' says Whitehorn. 'But we haven't accepted any bookings on that basis and won't until we understand what the safety issues might be.' Hooking up in zero gravity could present problems. 'Theoretically, it's difficult to do in a weightless environment,' explains Whitehorn. 'You've got the mass of a human body but no gravity to stop you being thrown in any direction. Two people flinging into each other could have interesting consequences - particularly for the male organ.' Two people flinging into each other could have interesting consequences - particularly for the male organ So Virgin's sub-orbital flights may be popping the cherry of research into extra-terrestrial rough and tumble. According to Whitehorn: 'We'll understand a lot better in 2009 how our cabin will behave for weightless people and whether we will allow them to do it,' says Whitehorn. 'They may then need training to have sex in space.' Solutions include handles, straps and bungees. US writer Vanna Bonta has proposed a giant sleeping bag-style contraption, called the 2suit, which couples zip into. Yet practicalities aren't top of the list for some researchers. Dr Jim Logan is co-founder of Space Medicine Associates in Houston (and formerly Nasa chief of medical operations, although he's keen to point out he's speaking in a private capacity). 'As a biologist and physician, I'm not worried about the challenges of what might be called "rendezvous and docking", he says. 'My concern is the implication of a pregnancy in space.' He has nothing less than the future of the human race in mind: 'A lot of people believe the success of our species depends on our ability to get off the planet to have viable, self-sustaining, self-replicating communities in space.' Space babies In some shuttle flights, males have shown a decrease in testosterone level and sexual drive, while astronauts who spend a long time in space also lose bone density, leading to fears that a baby conceived in a weightless environment could be born with brittle bones, unable to cope with Earth's gravity. Dr Logan believes reproduction in space is woefully under-researched: 'After 47 years of space flight, we have yet to see a mammal go from copulation to birth, growth and then reproduction by the next generation.' For now, though, we may be otherwise occupied when we lift off. 'If you've decided to undertake the adventure of seeing our planet from space, something only 470 people have done, you'll be taking in the experience of weightlessness and the beauty of the planet,' says Whitehorn. 'Sex is not going to be the first thing on your mind.' Tokyo-based Eri Matsui organised The Space Couture Design Contest in 2006 to look into the possibilities of spacewear. She designed the Zero-G bridal gown, which, apparently, hangs perfectly with or without gravity.

# NRC Adv

#### No Indo-Pak impact

Mutti 9— Master’s degree in International Studies with a focus on South Asia, U Washington. BA in History, Knox College. over a decade of expertise covering on South Asia geopolitics, Contributing Editor to Demockracy journal (James, 1/5, Mumbai Misperceptions: War is Not Imminent, http://demockracy.com/four-reasons-why-the-mumbai-attacks-wont-result-in-a-nuclear-war/, AG)

Fearful of imminent war, the media has indulged in frantic hand wringing about Indian and Pakistani nuclear arsenals and renewed fears about the Indian subcontinent being “the most dangerous place on earth.” As an observer of the subcontinent for over a decade, I am optimistic that war will not be the end result of this event. As horrifying as the Mumbai attacks were, they are not likely to drive India and Pakistan into an armed international conflict. The media frenzy over an imminent nuclear war seems the result of the media being superficially knowledgeable about the history of Indian-Pakistani relations, of feeling compelled to follow the most sensationalistic story, and being recently brainwashed into thinking that the only way to respond to a major terrorist attack was the American way – a war. Here are four reasons why the Mumbai attacks will not result in a war: 1. For both countries, a war would be a disaster. India has been successfully building stronger relations with the rest of the world over the last decade. It has occasionally engaged in military muscle-flexing (abetted by a Bush administration eager to promote India as a counterweight to China and Pakistan), but it has much more aggressively promoted itself as an emerging economic powerhouse and a moral, democratic alternative to less savory authoritarian regimes. Attacking a fledgling democratic Pakistan would not improve India’s reputation in anybody’s eyes. The restraint Manmohan Singh’s government has exercised following the attacks indicates a desire to avoid rash and potentially regrettable actions. It is also perhaps a recognition that military attacks will never end terrorism. Pakistan, on the other hand, couldn’t possibly win a war against India, and Pakistan’s military defeat would surely lead to the downfall of the new democratic government. The military would regain control, and Islamic militants would surely make a grab for power – an outcome neither India nor Pakistan want. Pakistani president Asif Ali Zardari has shown that this is not the path he wants his country to go down. He has forcefully spoken out against terrorist groups operating in Pakistan and has ordered military attacks against LeT camps. Key members of LeT and other terrorist groups have been arrested. One can hope that this is only the beginning, despite the unenviable military and political difficulties in doing so. 2. Since the last major India-Pakistan clash in 1999, both countries have made concrete efforts to create people-to-people connections and to improve economic relations. Bus and train services between the countries have resumed for the first time in decades along with an easing of the issuing of visas to cross the border. India-Pakistan cricket matches have resumed, and India has granted Pakistan “most favored nation” trading status. The Mumbai attacks will undoubtedly strain relations, yet it is hard to believe that both sides would throw away this recent progress. With the removal of Pervez Musharraf and the election of a democratic government (though a shaky, relatively weak one), both the Indian government and the Pakistani government have political motivations to ease tensions and to proceed with efforts to improve relations. There are also growing efforts to recognize and build upon the many cultural ties between the populations of India and Pakistan and a decreasing sense of animosity between the countries. 3. Both countries also face difficult internal problems that present more of a threat to their stability and security than does the opposite country. If they are wise, the governments of both countries will work more towards addressing these internal threats than the less dangerous external ones. The most significant problems facing Pakistan today do not revolve around the unresolved situation in Kashmir or a military threat posed by India. The more significant threat to Pakistan comes from within. While LeT has focused its firepower on India instead of the Pakistani state, other militant Islamic outfits have not. Groups based in the tribal regions bordering Afghanistan have orchestrated frequent deadly suicide bombings and clashes with the Pakistani military, including the attack that killed ex-Prime Minister Benazir Bhutto in 2007. The battle that the Pakistani government faces now is not against its traditional enemy India, but against militants bent on destroying the Pakistani state and creating a Taliban-style regime in Pakistan. In order to deal with this threat, it must strengthen the structures of a democratic, inclusive political system that can also address domestic problems and inequalities. On the other hand, the threat of Pakistani based terrorists to India is significant. However, suicide bombings and attacks are also carried out by Indian Islamic militants, and vast swaths of rural India are under the de facto control of the Maoist guerrillas known as the Naxalites. Hindu fundamentalists pose a serious threat to the safety of many Muslim and Christian Indians and to the idea of India as a diverse, secular, democratic society. Separatist insurgencies in Kashmir and in parts of the northeast have dragged on for years. And like Pakistan, India faces significant challenges in addressing sharp social and economic inequalities. Additionally, Indian political parties, especially the ruling Congress Party and others that rely on the support of India’s massive Muslim population to win elections, are certainly wary about inflaming public opinion against Pakistan (and Muslims). This fear could lead the investigation into the Mumbai attacks to fizzle out with no resolution, as many other such inquiries have. 4. The international attention to this attack – somewhat difficult to explain in my opinion given the general complacency and utter apathy in much of the western world about previous terrorist attacks in places like India, Pakistan, and Indonesia – is a final obstacle to an armed conflict. Not only does it put both countries under a microscope in terms of how they respond to the terrible events, it also means that they will feel international pressure to resolve the situation without resorting to war. India and Pakistan have been warned by the US, Russia, and others not to let the situation end in war. India has been actively recruiting Pakistan’s closest allies – China and Saudi Arabia – to pressure Pakistan to act against militants, and the US has been in the forefront of pressing Pakistan for action. Iran too has expressed solidarity with India in the face of the attacks and is using its regional influence to bring more diplomatic pressure on Pakistan.

#### Increased funding now

WNN 12 World Nuclear News, “Funding increased for Yucca Mountain review”08 June 2012http://www.world-nuclear-news.org/WR-Funding\_increased\_for\_Yucca\_Mountain\_review-0806124.html

**An additional $10 million in funding has been approved for the Nuclear Regulatory Commission (NRC)** to complete its review of the licence application for the Yucca Mountain repository. Last year, the NRC shelved the review after funding was slashed.¶ Yucca Mountain (Image: DoE)¶ The House of Representatives has voted 326-81 to adopt an amendment to the fiscal 2013 Energy and Water Development Appropriations Act (HR 5325) that transfers $10 million from the Department of Energy's (DoE's) administration account **to the NRC's salaries and expenses account.** The amendment - introduced by Congressman John Shimkus, chairman of the Environment and the Economy Subcommittee - **increases the NRC's funds** for the review from $25 million to $35 million

.¶ Federal responsibility for all US civil used nuclear fuel was enshrined in the 1982 Nuclear Waste Policy Act, which was amended in 1987 to designate Yucca Mountain as the sole initial repository for the country's high-level nuclear waste, effectively tying the entire US high-level waste management program to the fate of the Nevada site. However, with billions of dollars since being spent on evaluating Yucca Mountain, the Obama administration eliminated the project's funding in early 2010 and the DoE subsequently withdraw its licence application.¶ "After having spent 30 years and $15 billion, the NRC refuses to follow the law and complete the review process. This amendment removes the excuse that they do not have the funds to perform their task."¶ Congressman John Shimkus¶ The Atomic Safety and Licensing Board (ASLB) ruled in mid-2010 that the Yucca Mountain project and the site were authorised by Congress in 2002 and the DoE did not have the right to cancel and withdraw the licence application without going back to the lower house. The licence application was therefore returned to the NRC for review.¶ In 2011, the NRC failed to overturn the ASLB's ruling. This decision affirmed the legal responsibility of the NRC to review the licence application, but the commission still instructed the ASLB to close out the licence review process citing inadequate funding.¶ Following the adoption of the amendment, Shimkus said, "This continues to show House support for completion of the Yucca Mountain review process **within NRC**. After having spent 30 years and $15 billion, the NRC refuses to follow the law and complete the review process. This amendment removes the excuse that they do not have the funds to perform their task."¶ Fred Upton, chairman of the Energy and Commerce Committee, commented, "I applaud Shimkus for offering this amendment to ensure the future of Yucca Mountain is no longer held captive to political games by allowing the NRC, as the independent objective federal agency, to finish the review."¶ The Washington DC-based Nuclear Energy Institute (NEI) welcomed the approval of the amendment. Alex Flint, NEI's senior vice president for governmental affairs, said: "Congressman Shimkus' leadership in this area has been central to Congress' effort to spur the development of a disposal facility that will safely and securely manage nuclear fuel from commercial and defence applications."