## Plan

**The United States Federal Government should obtain, through alternative financing, electricity from small modular reactors for military bases in the United States.**

**Adv 1**

**Advantage 1- Islanding**

**Small nuclear reactors key to prevent bases from being vulnerable to inevitable grid outages- the impact is nuclear war**

**Andres and Breetz 11**

(Richard B. Andres is Professor of ¶ national Security Strategy at the ¶ national War College and a Senior fellow and energy and environmental ¶ Security and Policy Chair in the Center ¶ for Strategic research, institute for national Strategic Studies, at the national Defense University. Hanna L. Breetz is a doctoral candidate in the Department of Political Science at the Massachusetts institute of technology, “Small Nuclear Reactors ¶ for Military Installations:¶ Capabilities, Costs, and ¶ Technological Implications” Institute for National Strategic Studies, <http://www.ndu.edu/press/lib/pdf/strforum/sf-262.pdf>, SEH)

Grid Vulnerability. DOD is unable to provide its ¶ bases with electricity when the civilian electrical grid is ¶ offline for an extended period of time. Currently, domestic military installations receive 99 percent of their ¶ electricity from the civilian power grid. As explained in a ¶ recent study from the Defense Science Board:¶ DOD’s key problem with electricity is that critical ¶ missions, such as national strategic awareness and ¶ national command authorities, are almost entirely ¶ dependent on the national transmission grid . . . ¶ [which] is fragile, vulnerable, near its capacity ¶ limit, and outside of DOD control. In most cases, ¶ neither the grid nor on-base backup power provides¶ sufficient reliability to ensure continuity of critical ¶ national priority functions and oversight of ¶ strategic missions in the face of a long term (several ¶ months) outage.¶ 7¶ The grid’s fragility was demonstrated during the 2003 ¶ Northeast blackout in which 50 million people in the ¶ United States and Canada lost power, some for up to a ¶ week, when one Ohio utility failed to properly trim trees. ¶ The blackout created cascading disruptions in sewage ¶ systems, gas station pumping, cellular communications, ¶ border check systems, and so forth, and demonstrated the ¶ interdependence of modern infrastructural systems.¶ 8¶ More recently, awareness has been growing that ¶ the grid is also vulnerable to purposive attacks. A report sponsored by the Department of Homeland Security suggests that a coordinated cyberattack on the grid ¶ could result in a third of the country losing power for ¶ a period of weeks or months.¶ 9¶ Cyberattacks on critical ¶ infrastructure are not well understood. It is not clear, for ¶ instance, whether existing terrorist groups might be able ¶ to develop the capability to conduct this type of attack. It ¶ is likely, however, that some nation-states either have or ¶ are working on developing the ability to take down the ¶ U.S. grid. In the event of a war with one of these states, ¶ it is possible, if not likely, that parts of the civilian grid ¶ would cease to function, taking with them military bases ¶ located in affected regions.¶ Government and private organizations are currently ¶ working to secure the grid against attacks; however, it is ¶ not clear that they will be successful. Most military bases ¶ currently have backup power that allows them to function for a period of hours or, at most, a few days on their ¶ own. If power were not restored after this amount of time, ¶ the results could be disastrous. First, military assets taken ¶ offline by the crisis would not be available to help with disaster relief. Second, during an extended blackout, global ¶ military operations could be seriously compromised; this ¶ disruption would be particularly serious if the blackout ¶ was induced during major combat operations. During the ¶ Cold War, **this type of event** was far less likely because the United States and Soviet Union shared the common understanding that blinding an opponent **with a grid blackout could escalate to nuclear war. America’s current opponents,** however, **may not share this fear or be deterred ¶ by this possibility**.¶ In 2008, the Defense Science Board stressed that ¶ DOD should mitigate the electrical grid’s vulnerabilities by turning military installations into “islands” of ¶ energy self-sufficiency.¶ 10¶ The department has made efforts to do so by promoting efficiency programs that ¶ lower power consumption on bases and by constructing ¶ renewable power generation facilities on selected bases. ¶ Unfortunately, these programs will not come close to ¶ reaching the goal of islanding the vast majority of bases. ¶ Even with massive investment in efficiency and renewables, most bases would not be able to function for more ¶ than a few days after the civilian grid went offline. Unlike other alternative sources of energy, small reactors have the potential to solve DOD’s vulnerability to ¶ grid outages. Most bases have relatively light power demands when compared to civilian towns or cities. Small ¶ reactors could easily support bases’ power demands separate from the civilian grid during crises. In some cases, ¶ the reactors could be designed to produce enough power ¶ not only to supply the base, but also to provide critical ¶ services in surrounding towns during long-term outages.¶ Strategically, islanding bases with small reactors ¶ has another benefit. One of the main reasons an enemy ¶ might be willing to risk reprisals by taking down the ¶ U.S. grid during a period of military hostilities would ¶ be to affect ongoing military operations. Without the ¶ lifeline of intelligence, communication, and logistics ¶ provided by U.S. domestic bases, American military operations would be compromised in almost any conceivable contingency. Making bases more resilient to ¶ civilian power outages would reduce the incentive for ¶ an opponent to attack the grid. An opponent might ¶ still attempt to take down the grid for the sake of disrupting civilian systems, but the powerful incentive to ¶ do so in order to win an ongoing battle or war would ¶ be greatly reduced.

**Grids goes down- laundry list of reasons**

**Slavo 7/12**

(Mac is editor of shftplan, “UPDATE: Cascading Grid Crash: Now 600 Million Without Power in India (Are We Vulnerable?)” <http://www.shtfplan.com/headline-news/paralysis-grid-down-in-india-370-million-left-without-power_07302012>, SEH)

**The power grid in the United States**, while more advanced and apparently better maintained, **is** also **under excessive strain as has been witnessed in recent years with rolling brownouts, blackouts, and unforeseen crashes** resulting from key component failure.¶ **One industry insider** who has worked in the utility industry for nearly two decades **advised** this author recently **that it wouldn’t take much to bring down the system even in the United States**, potentially affecting tens of millions of customers. Though it’s the 21st century, many grid components in operation are, in some cases, as much as 40 years old, thus replacement parts are almost impossible to find. Other components, like massive transformers may take weeks or months to replace. In the event of a scenario where multiple components are targeted simultaneously, by either a man-made EMP or natural event, it is not too far of a stretch to suggest that the afflicted regions would be engulfed in pandemonium.¶ **This potential for widespread failure is so plausible that former Congressman** Roscoe Bartlett, **who has spoken on the vulnerabilities of the US power grid, has advised that Those Who Can, Should Move Their Families Out Of the City**:¶ After Hurricane Ike passed through the Houston area 2008 some 90% of the metropolitan was without power. While hospitals, police and critical infrastructure was restored within a few days, residents in outlying suburban areas experienced the outage for over three weeks. We witnessed the rapid loss of patience, increased anxiety and frustration, and the subsequent breakdown of interpersonal interaction at high-demand venues such as gas stations, where long lines, screaming matches and even fist fights became a common occurrence.¶ **The bottom line: As demonstrated in India today**, Quebec in 1989 (caused by a geo-magnetic storm originating from the sun), Ike in 2008, Hurricane Irene on the East coast in 2012 and the plethora of incidents that have taken place over the last couple of decades, **the North American power grid,** just as India’s, **is susceptible to far-from-equilibrium situations, and sometimes it takes extended periods of time to get power up and running**.¶ **With just three major grids running the United States**, **our dependence on massive flows of electricity to power** our home air conditioners, food refrigeration, communications, water and gas pump systems, and daily business operations **could come to a screeching halt should the grid ever be struck by a natural disaster like a solar coronal mass ejection or a large-scale earthquake** in California or on the Madrid fault. Likewise, as we’ve noted previously, **rogue organizations looking to wreak havoc have already demonstrated the staggering security holes in our power**, water and oil **grid infrastructure, with leading cyber security firms noting that it is just a matter of time before disaster strikes.**¶ While a short-term, isolated metropolitan outage can be dealt with by sourcing labor and supplies from unaffected areas of the country, **considering that the US operates on three key power grid systems, a region-wide outage affecting just one of these nodes could lead to a cascading breakdown in the electrical power system that envelops the entire country**.¶ The **most dangerous possibility emerges when we look at threats posed by the sun or a rogue terror cell or nation that could deploy an** Electro-Magnetic Pulse weapon (**EMP /** Super EMP) over American skies**. It’s been surmised that either one of these possibilities could cause damage so staggering that the grid would be down for months**, leaving millions without just-in-time food and gas delivery systems, medical care, local emergency response, or even clean water. According to one estimate, some 90% of Americans would die in such a scenario if the power wasn’t restored within one year.¶ Thus, it is clear that our power grids are a critical lifeline to keeping life as we know it in the world today operational. And, as we have seen historically and India this morning, power grids can and do crash – even in countries with hundreds of millions of residents.

**Cyber-attack is coming ---actors are probing grid weaknesses**

**Reed 10/11** John, Reports on the frontiers of cyber war and the latest in military technology for Killer Apps at Foreign Policy, "U.S. energy companies victims of potentially destructive cyber intrusions", 2012, killerapps.foreignpolicy.com/posts/2012/10/11/us\_energy\_companies\_victims\_of\_potentially\_destructive\_cyber\_attacks

Foreign actors are probing the networks of key American companies in an attempt to gain control of industrial facilities and transportation systems, Defense Secretary Leon Panetta revealed tonight.¶ "We know that foreign **cyber actors are probing America's critical infrastructure networks**," said Panetta, disclosing previously classified information during a speech in New York laying out the Pentagon's role in protecting the U.S. from cyber attacks. "They are targeting the computer control systems that operate chemical, **electricity** and water plants, and those that guide transportation thorough the country."¶ He went on to say that the U.S. government knows of "specific instances where intruders have gained access" to these systems -- frequently known as Supervisory Control and Data Acquisition (or SCADA) systems -- and that "they are seeking to create advanced tools to attack these systems and cause panic, destruction and even the loss of life," according to an advance copy of his prepared remarks.¶ The secretary said that **a coordinated attack on enough critical infrastructure could be a "cyber Pearl Harbor" that would "cause physical destruction and loss of life, paralyze and shock the nation, and create a profound new sense of vulnerability.**"¶ While there have been reports of criminals using 'spear phishing' email attacks aimed at stealing information about American utilties, Panetta's remarks seemed to suggest more sophisticated, nation-state backed attempts to actually gain control of and damage power-generating equipment. ¶ Panetta's comments regarding the penetration of American utilities echo those of a private sector cyber security expert Killer Apps spoke with last week **who said that the networks of American electric companies were penetrated, perhaps in preparation for a Stuxnet-style attack**.¶ Stuxnet is the famous cyber weapon that infected Iran's uranium-enrichment centrifuges in 2009 and 2010. Stuxnet is believed to have caused some of the machines to spin erratically, thereby destroying them.¶ "**There is hard evidence** that there has been penetration of our power companies, and given Stuxnet, that is a staging step before destruction" of electricity-generating equipment, the expert told Killer Apps. Because uranium centrifuges and power turbines are both spinning machines, "**the attack is identical -- the one to take out the centrifuges and the one to take out our power systems is the same attack**."¶ "If a centrifuge running at the wrong speed can blow apart" so can a power generator, said the expert. "If you do, in fact, spin them at the wrong speeds, you can blow up any rotating device."¶ Cyber security expert Eugene Kaspersky said two weeks ago that one of his greatest fears is someone reverse-engineering a sophisticated cyber weapon like Stuxnet **-- a relatively easy task** -- and he noted that Stuxnet itself passed through power plants on its way to Iran. "Stuxnet infected thousands of computer systems all around the globe, I know there were power plants infected by Stuxnet very far away from Iran," Kaspersky said.

**Military vulnerability risks eviscerates the military and risks nuclear war**

**The Examiner 7/27**

(Robert Tilford, Graduate US Army Airborne School, Ft. Benning, Georgia, “Cyber attackers could shut down the electric grid for the entire east coast” <http://www.examiner.com/article/cyber-attackers-could-easily-shut-down-the-electric-grid-for-the-entire-east-coa>, SEH)

To make matters worse a cyber attack that can take out a civilian power grid, for example could also cripple the U.S. military.¶ The senator notes that is that the same power grids that supply cities and towns, stores and gas stations, cell towers and heart monitors also power “every military base in our country.”¶ “Although bases would be prepared to weather a short power outage with backup diesel generators, within hours, not days, fuel supplies would run out”, he said.¶ Which means military command and control centers could go dark.¶ Radar systems that detect air threats to our country would shut¶ Down completely.¶ “Communication between commanders and their troops would also go silent. And many weapons systems would be left without either fuel or electric power”, said Senator Grassley.¶ “So in a few short hours or days, the mightiest military in the world would be left scrambling to maintain base functions”, he said.¶ We contacted the Pentagon and officials confirmed the threat of a cyber attack is something very real.¶ Top national security officials—including the Chairman of the Joint Chiefs, the Director of the National Security Agency, the Secretary of Defense, and the CIA Director— have said, “preventing a cyber attack and improving the nation’s electric grids is among the most urgent priorities of our country” (source: Congressional Record).¶ So how serious is the Pentagon taking all this?¶ Enough to start, or end a war over it, for sure (see video: Pentagon declares war on cyber attacks http://www.youtube.com/watch?v=\_kVQrp\_D0kY&feature=relmfu ).¶ A cyber attack today against the US could very well be seen as an “Act of War” and could be met with a “full scale” US military response.¶ That could include the use of “nuclear weapons”, if authorized by the President.

**Loss of mission effectiveness causes nuclear war in every hotspot**

**Kagan and O’Hanlon 7** Frederick, resident scholar at AEI and Michael, senior fellow in foreign policy at Brookings, “The Case for Larger Ground Forces”, April 2007, http://www.aei.org/files/2007/04/24/20070424\_Kagan20070424.pdf

We live at a time when wars not only rage in nearly every region but threaten to erupt in many places where the current relative calm is tenuous. To view this as a strategic military challenge for the United States is not to espouse a specific theory of America’s role in the world or a certain political philosophy. Such an assessment flows directly from the basic bipartisan view of American foreign policy makers since World War II that overseas threats must be countered before they can directly threaten this country’s shores, that the basic stability of the international system is essential to American peace and prosperity, and that no country besides the United States is in a position to lead the way in countering major challenges to the global order. Let us highlight the threats and their consequences with a few concrete examples, emphasizing those that involve key strategic regions of the world such as the Persian Gulf and East Asia, or key potential threats to American security, such as the spread of nuclear weapons and the strengthening of the global Al Qaeda/jihadist movement. The Iranian government has rejected a series of international demands to halt its efforts at enriching uranium and submit to international inspections. What will happen if the US—or Israeli—government becomes convinced that Tehran is on the verge of fielding a nuclear weapon? North Korea, of course, has already done so, and the ripple effects are beginning to spread. Japan’s recent election to supreme power of a leader who has promised to rewrite that country’s constitution to support increased armed forces—and, possibly, even nuclear weapons— may well alter the delicate balance of fear in Northeast Asia fundamentally and rapidly. Also, in the background, at least for now, Sino Taiwanese tensions continue to flare, as do tensions between India and Pakistan, Pakistan and Afghanistan, Venezuela and the United States, and so on. Meanwhile, the world’s nonintervention in Darfur troubles consciences from Europe to America’s Bible Belt to its bastions of liberalism, yet with no serious international forces on offer, the bloodletting will probably, tragically, continue unabated. And as bad as things are in Iraq today, they could get worse. What would happen if the key Shiite figure, Ali al Sistani, were to die? If another major attack on the scale of the Golden Mosque bombing hit either side (or, perhaps, both sides at the same time)? Such deterioration might convince many Americans that the war there truly was lost—but the costs of reaching such a conclusion would be enormous. Afghanistan is somewhat more stable for the moment, although a major Taliban offensive appears to be in the offing. Sound US grand strategy must proceed from the recognition that, over the next few years and decades, the world is going to be a very unsettled and quite dangerous place, with Al Qaeda and its associated groups as a subset of a much larger set of worries. The only serious response to this international environment is to develop armed forces capable of protecting America’s vital interests throughout this dangerous time**. Doing so requires a military capable of a wide range of missions**—including not only deterrence of great power conflict in dealing with potential hotspots in Korea, the Taiwan Strait, and the Persian Gulf but also associated with a variety of Special Forces activities and stabilization operations. For today’s US military, which already excels at high technology and is increasingly focused on re-learning the lost art of counterinsurgency, this is first and foremost a question of finding the resources to field a large-enough standing Army and Marine Corps to handle personnel intensive missions such as the ones now under way in Iraq and Afghanistan. Let us hope there will be no such large-scale missions for a while. But preparing for the possibility, while doing whatever we can at this late hour to relieve the pressure on our soldiers and **Marines** in ongoing operations, is prudent. At worst, the only potential downside to a major program to strengthen the military is the possibility of spending a bit too much money. **Recent history shows no link between having a larger military and its overuse**; indeed, Ronald Reagan’s time in office was characterized by higher defense budgets and yet much less use of the military, an outcome for which we can hope in the coming years, but hardly guarantee. While the authors disagree between ourselves about proper increases in the size and cost of the military (with O’Hanlon preferring to hold defense to roughly 4 percent of GDP and seeing ground forces increase by a total of perhaps 100,000, and Kagan willing to devote at least 5 percent of GDP to defense as in the Reagan years and increase the Army by at least 250,000), we agree on the need to start expanding ground force capabilities by at least 25,000 a year immediately. Such a measure is not only prudent, it is also badly overdue.

**We control empirics**

**Wohlforth 8—**Daniel Webster Professor of Government, Dartmouth. BA in IR, MA in IR and MPhil and PhD in pol sci, Yale (William, Unipolarity, Status Competition, and Great Power War, October 2008, World Politics Vol. 61, Iss. 1; pg. 28, 31 pgs, Proquest)

Despite increasingly compelling findings concerning the importance of status seeking in human behavior, research on its connection to war waned some three decades ago.38 Yet empirical studies of the relationship between both systemic and dyadic capabilities distributions and war have continued to cumulate. If the relationships implied by the status theory run afoul of well-established patterns or general historical findings, then there is little reason to continue investigating them. **The clearest empirical implication** of the theory **is that** status **competition is unlikely to cause great power military conflict in unipolar systems**. If status competition is an important contributory cause of great power war, then, ceteris paribus, unipolar systems should be markedly less war-prone than bipolar or multipolar systems. And this appears to be the case. As Daniel Geller notes in a review of the empirical literature: "**The only polar structure that appears to influence conflict probability is unipolarity**."39 In addition, a larger number of studies at the dyadic level support the related expectation that narrow capabilities gaps and ambiguous or unstable capabilities hierarchies increase the probability of war.40 These studies are based entirely on post-sixteenth-century European history, and most are limited to the post-1815 period covered by the standard data sets. Though the systems coded as unipolar, near-unipolar, and hegemonic are all marked by a high concentration of capabilities in a single state, these studies operationalize unipolarity in a variety of ways, often very differently from the definition adopted here. An ongoing collaborative project looking at ancient interstate systems over the course of two thousand years suggests that historical systems that come closest to the definition of unipolarity used here exhibit precisely the behavioral properties implied by the theory. 41 As David C. Kang's research shows, the East Asian system between 1300 and 1900 was an unusually stratified unipolar structure, with an economic and militarily dominant China interacting with a small number of geographically proximate, clearly weaker East Asian states.42 Status politics existed, but actors were channeled by elaborate cultural understandings and interstate practices into clearly recognized ranks. Warfare was exceedingly rare, and the major outbreaks occurred precisely when the theory would predict: when China's capabilities waned, reducing the clarity of the underlying material hierarchy and increasing status dissonance for lesser powers. Much more research is needed, but initial exploration of other arguably unipolar systems-for example, Rome, Assyria, the Amarna system-appears consistent with the hypothesis.43 Status Competition and Causal Mechanisms Both theory and evidence demonstrate convincingly that competition for status is a driver of human behavior, and social identity theory and related literatures suggest the conditions under which it might come to the fore in great power relations. Both the systemic and dyadic findings presented in large-N studies are broadly consistent with the theory, but they are also consistent with power transition and other rationalist theories of hegemonic war.

**Adv 2**

**DOD SMRs key to water diplomacy---only way to ensure effective supplies in drought-affected areas**

**Pfeffer, 1**

(Physical Scientist- Army Nuclear and Chemical Agency, MS-Physics at Johns Hopkins, “Nuclear Power: An option for the Army’s Future,” http://www.almc.army.mil/alog/issues/SepOct01/MS684.htm)

The idea of using nuclear power to produce synthetic fuels, originally proposed in 1963, remains feasible today and is gaining significant attention because of recent advances in fuel cell technology, hydrogen liquefaction, and storage. At the same time, nuclear power has become a significant part of the energy supply in more than 20 countries—providing energy security, reducing air pollution, and cutting greenhouse gas emissions. The performance of the world's nuclear power plants has improved steadily and is at an all-time high. Assuming that nuclear power experiences further technological development and increased public acceptance as a safe and efficient energy source, its use will continue to grow. Nuclear power possibly could provide district heating, industrial process heating, desalination of seawater, and marine transportation. Demand for cost-effective chemical fuels such as hydrogen and methanol is expected to grow rapidly. Fuel cell technology, which produces electricity from low-temperature oxidation of hydrogen and yields water as a byproduct, is receiving increasing attention. Cheap and abundant hydrogen eventually will replace carbon-based fuels in the transportation sector and eliminate oil's grip on our society. But hydrogen must be produced, since terrestrial supplies are extremely limited. Using nuclear power to produce hydrogen offers the potential for a limitless chemical fuel supply with near-zero greenhouse gas emissions. As the commercial transportation sector increasingly moves toward hydrogen fuel cells and other advanced engine concepts to replace the gasoline internal combustion engine, DOD eventually will adopt this technology for its tactical vehicles. The demand for desalination of seawater also is likely to grow as inadequate freshwater supplies become an urgent global concern. Potable water in the 21st century will be what oil was in the 20th century—a limited natural resource subject to intense international competition. In many areas of the world, rain is not always dependable and ground water supplies are limited, exhausted, or contaminated. Such areas are likely to experience conflict among water-needy peoples, possibly prompting the deployment of U.S. ground forces for humanitarian relief, peacekeeping, or armed intervention. **A mobile desalination plant using waste heat from a nuclear reactor could help prevent conflicts** or **provide emergency supplies of freshwater to indigenous populations**, and to U.S. deployed forces if necessary. Promising Technology for Tomorrow **Compact reactor concepts** based on high-temperature, gas-cooled reactors **are attracting attention worldwide and could someday fulfill the role** once envisioned for the energy depot. One proposed design is the pebble bed modular reactor (PBMR) being developed by Eskom in South Africa. Westinghouse, BNFL Instruments Ltd., and Exelon Corporation currently are supporting this project to develop commercial applications. A similar design is the remote site-modular helium reactor (RS-MHR) being developed by General Atomics. If proven feasible, this technology could be used to replace retiring power plants, expand the Navy's nuclear fleet, and provide mobile electric power for military or disaster relief operations. Ideally, modular nuclear power plants could be operated by a small staff of technicians and monitored by a central home office through a satellite uplink. The technology of both the PBMR and the RS-MHR features small, modular, helium-cooled reactors powered by ceramic-coated fuel particles that are inherently safe and cannot melt under any scenario. This results in simpler plant design and lower capital costs than existing light water reactors. The PBMR, coupled with a direct-cycle gas turbine generator, would have a thermal efficiency of about 42 to 45 percent and would produce about 110 megawatts of electricity (MWe). The smaller RS-MHR would produce about 10 to 25 MWe, which is sufficient for powering remote communities and military bases. Multiple modules can be installed on existing sites and refueling can be performed on line, since the fuel pebbles recycle through the reactor continuously until they are expended. Both designs also feature coolant exit temperatures high enough to support the thermochemical water-splitting cycles needed to produce hydrogen. For military applications, RS-MHR equipment could be transported inland by truck or railroad, or single modules could be built on barges and deployed as needed to coastal regions. The Army's nuclear reactor on the barge Sturgis, which provided electric power to the Panama Canal from 1968 to 1976, demonstrated the feasibility of this concept. In fact, the military previously used several power barges (oil-fired, 30-MWe power plants) during World War II and in Korea and Okinawa as emergency sources of electric power. Research teams around the world also are examining other reactor concepts based on liquid-metal-cooled reactor systems with conventional sodium or lead-alloy coolants and advanced water-cooled systems. The Department of Energy (DOE) is supporting research and development of innovative concepts that are based on ultra-long-life reactors with cartridge cores. These reactors would not require refueling, and they could be deployed in the field, removed at the end of their service life, and replaced by a new system. The proposed international reactor innovative and secure (IRIS) design, funded by DOE's Nuclear Energy Research Initiative, would have a straight burn core lasting 8 years and may be available by 2010. Based on increasing costs of fossil fuels, a growing consensus that greenhouse gas emissions must be reduced, and a growing demand for energy, there is little doubt that we will continue to see significant advances in nuclear energy research and development. Nuclear power is expected to grow in the 21st century, with potential benefits applicable to the military. **Small, modular nuclear power reactors** in mobile or portable configurations, coupled with hydrogen production and desalination systems, **could be used to produce** fuel and **portable water for combat forces deployed in remote areas and reduce our logistics requirements**. Assuming the inevitability of hydrogen fuel replacing fossil fuels, a clearly defined objective that was missing in 1966 now exists. The partnership between DOD and the former AEC to develop Army nuclear reactors contributed to the technology of both military and small commercial power plants. This historical relationship should be renewed based on recent technological advances and projected logistics requirements. **DOD logistics planners should reconsider military applications of nuclear power** and support ongoing DOE research and development initiatives **to develop advanced reactors** such as RS-MHR, IRIS, and others**. For the Army to fight and win on tomorrow's distant battlefields, nuclear power will have to play a significant role.**

**Military SMRs key to mobile desalination and water delivery—only energy source that solve**

**Butler 10**

Lieutenant Colonel, Glen, Why the Marine Corps should lead the environmental and energy way forward and how to do it http://www.mca-marines.org/gazette/not-green-enough

Environmental and energy (E2) issues have been politically ladened topics throughout their existence in the public’s consciousness. In the 1970s, E2-concerned citizens were stereotypically depicted as hippies building solar farms on communes, although OPEC’s (Organization of Petroleum Exporting Country’s) actions and the oil embargo of 1973 shot fuel dependency into the mainstream. Nevertheless, the country took little sustained notice after a brief period of heightened concern. In the 1980s and 1990s, the Marine Corps’ E2 was largely focused on compliance with existing regulations, prevention of oil spills and hazardous material incidents, and stewardship of threatened or endangered species. However, “green fever” transitioned E2 from an emotional peacenik mantra—first into the marketer’s delight, and more recently, into genuine national concern. The government, for its part, has brought in another important consideration particularly emphasized within the last few years—E2 as a national security linchpin.1 Whether you stand behind global warming or “climategate” matters little; we as Marines should understand that these issues are not Republican or Democrat and not a mere debate between Al Gore and Sean Hannity.2 E2 issues are now at the forefront of everything we do, validated by a preponderance of Federal directives and related military mandates. Both the Secretary of the Navy (SecNav) and Commandant of the Marine Corps (CMC) have made their positions clear via broad and innovative guidance.3 From the CMC’s Marine Energy Assessment Team and Expeditionary Energy Office to Secretary Raymond Mabus’ “Great Green Fleet,”4 the Navy-Marine Team has never had stronger green leadership. Nevertheless, **the Marine Corps has yet to fully seize the moment and take truly bold and daring steps.** Most every Service and successful organization has embraced the green revolution in some form, but **the Marine Corps has work remaining if it desires to lead the charge in typical Marine fashion**. With support to our combat deployed forces remaining the number one priority, it is understandable that expeditionary energy is the focus. But if installations are truly the fifth element of the MAGTF,5 this emphasis must be broadened to include warfighters’ stateside homes. There are many avenues in the E2 arena to accomplish this; here are just a few recommendations. Back Policy With Resources Much green verbiage today is delivered in neat, round goals (“reduce XXX 20 percent by 2020,” etc.) bathed in cliché ecoterms like “alternative,” “renewable,” “clean,” and “sustainable.”6 Yet without resources to support those goals, this is but a promulgation of the ends but not the ways or means. To help correct this problem the Marine Corps should lead endeavors for joint force planning, identify potentially synergetic projects, lobby for substantial E2-targeted resources,7 and develop more Marine-specific, Corps-wide guidance to secure future mission capabilities. Continue Multifaceted Approach, but Standardize Best Practices Many significant E2 initiatives exist across the Corps, yet most remain a patchwork of uncoupled and often competing efforts cobbled together by energetic commanders and creative action officers. We need a centralized, web-based hub to share best practices, voice concerns, and foster additional E2 learning,8 and all bases and stations should establish dedicated, robust energy websites.9 Although installations should retain a degree of flexibility to suit local nuances of region, they should capitalize on successful programs by replication through directives and with resources from the top; where good ideas exist, adopt these best practices Service-wide.10 Pursue bold, long-term programs but also easy quick-kills to show progress and produce a gradual paradigm shift.11 Even so, be leery of excessive “innovations” that substitute unnecessary inconvenience (like trayless mess halls) in place of education and impractical rationing that ignores realities of operational requirements, mission expansion, and population growth.12 Focus on educating Marines and families to make proper choices. Enhance Education For better linkage with our Operating Forces, infuse the E2 sector across the fifth element with uniformed Marines. Just as developing computer/Internet technology and operations necessitated the creation of new computer-related MOSs/billets in the 1990s, so too should we now lean forward and inject professionally trained active duty officers into the E2 field (not just civilian logisticians).13 Higher level guidance on E2 issues is (overly) abundant,14 yet the education piece—(key to drive a cultural shift and often the most effective method for positive change) is severely lacking. Our resident and nonresident professional military education curricula lack any modern E2 instruction.15 The majority of actionable and educational initiatives are left to the local commander’s own resourcefulness. In addition to attendance at E2 conferences16 and liaison between the new Marine Corps/Navy Energy Offices, the Marine Corps should collaborate with our Navy leadership to develop high-quality educational programs, available on a variety of levels (from MarineNet to The Basic School to the war colleges to the Naval Postgraduate School), to ensure that our next generation of Marines and sailors is poised to lead the way forward in E2 fields, including renewable, alternative and, yes, nuclear energy technologies. Consider Nuclear Power On 16 March 1979, The China Syndrome opened in theaters across the country, depicting a fictitious story about a reporter witnessing an accident at the Ventanna nuclear plant outside Los Angeles and the subsequent evil plot to suppress the truth. Twelve days later the Three Mile Island partial core meltdown in Pennsylvania helped propel The China Syndrome to theatrical success and permanently scarred the American psyche. The nail in the nuclear energy coffin was the nuclear disaster 7 years later at Chernobyl, in the Ukrainian Soviet Socialist Republic.17 But despite these stains on the nuclear power industry, the time has never been better for the Marine Corps (and Navy) to dive in than now. Here’s why. First, the political climate, though still tenuous, is shifting to favorable, with the change coming from the top down. During his 27 January 2010 State of the Union address, President Barack Obama echoed themes from his campaign trail by clearly voicing his intention to include nuclear power in American’s playbook of energy security options.18 Similarly, as the Department of Energy’s (DoE’s) Secretary of Energy, Steven Chu has articulated similar sentiments, declaring that “President Obama and I are committed to restarting the nuclear industry in the United States.”19 Many other political leaders and policymakers indeed support a true “nuclear renaissance,”20 and the growing momentum stands a chance to bury the ghosts of Chernobyl once and for all. Second, with our **well-replicated but limited pursuit of the standard renewable energies,21 we’re putting all energy eggs in one basket, a vessel unlikely to hold a sufficient load for success**. Currently pursued renewable energy sources do have limitations.22 More importantly, with military installations relying almost exclusively on external sources for energy, and those sources largely unpredictable, unsecured, and reliant on foreign-based oil,23 if energy security is truly a national security issue, then nuclear power should be considered. Solar demonstrations at Miramar and Barstow are not enough. Third, nuclear technology today has advanced well beyond the days of Three Mile Island. Specifically, small modular reactors (**SMRs) offer great potential to safely and effectively provide energy island/net zero capabilities to Marine Corps** and Navy **installations** across the country.24 SMRs have relatively low plant cost, can replace aging fossil plants, and do not emit greenhouse gasses. Some are as small as a “hot tub” and can be stored underground, dramatically increasing safety and security from terrorist threats.25 Encouragingly, in fiscal year 2010 (FY10) the DoE allocated $0 to the U.S. SMR Program; in FY11, they’ve requested $38.9 million. This funding is to support two main activities—public/private partnerships to advance SMR designs and research and development and demonstrations. According to the DoE’s website, one of the planned program accomplishments for FY11 is to “collaborate with the Department of Defense (DoD) . . . to assess the feasibility of SMR designs for energy resources at DoD installations.”26 The Marine Corps should vigorously seek the opportunity to be a DoD entity providing one platform for this feasibility assessment.27 Fourth, SMR technology offers the Marine Corps another unique means to lead from the front—not just of the other Services but also of the Nation, and even the world.28 This potential Pete Ellis moment should be seized. There are simple steps we could take,29 and others stand ready to lead if we are not.30 But **the temptation to “wait and see**” and “let the others do it; **then we’ll adopt it” mentality is not always best.** Energy security demands boldness, not timidity. To be fair, nuclear technology comes with challenges, of course, and with questions that have been kicked around for decades. An April 1990 Popular Science article asked, “Next Generation Nuclear Reactors—Dare we build them?” and included some of the same verbiage heard in similar discussions today.31 Compliance with National Environment Policy Act requirements necessitates lengthy and detailed preaction analyses, critical community support must be earned, and disposal challenges remain. Still, none of these hurdles are insurmountable.32 Yet despite the advances in safety, security, and efficiency in recent years, nuclear in the energy equation remains the new “n-word” for most military circles. And despite the fact that the FY10 National Defense Authorization Act called on the DoD to “conduct a study [of] the feasibility of nuclear plants on military installations,” the Office of the Secretary of Defense has yet to fund the study.33 Fifth, the cumbersome, bureaucratic certification process of the Nuclear Regulatory Commission (NRC), often enough to scare away potential entrepreneurs and investors, is not necessarily a roadblock to success. The NRC is “responsible for licensing and regulating the operation of commercial nuclear power plants in the United States.” Military installations offer unique platforms that could likely bypass an extended certification process. With established expertise and a long safety record in nuclear reactor certification, operations, training, and maintenance, the Naval Nuclear Propulsion Program comprises the civilian and military personnel who: . . . design, build, operate, maintain, and manage the nuclear-powered ships and the many facilities that support the U.S. nuclear-powered naval fleet.”34 Bypassing the NRC and initiating SMR experimentation under ADM Hyman Rickover’s legacy umbrella of naval reactors could shorten the process to a reasonable level for Marine and naval installations.35 Finally, Marine Corps-SMR technology opens the pathway for related endeavors and synergetic undertakings. The Army has several smart and influential individuals poised to partner in nuclear energy endeavors, and our naval brethren enjoy a long history of nuclear reactor expertise. Partnerships and enhanced use leases to support SMR deployments should be leveraged.**36 As the collective military expertise in SMR technology grows**, additional capabilities, such as expeditionary and vehicular power sources, could be explored. And **related technologies, such as** hybrid/electric vehicle power storage and recharging facilities and **water desalination plants, could collocate with nuclear plants on installations to both use the energy.**37 Explore Desalination Desalination is another evolving technology that many avoid discussing, mainly because it is still a very expensive and immature technology with problems such as high energy consumption, brine disposal, and potential for harm to marine life. But once again, fear of the challenges should not prevent expanded exploration in this area. Worldwide, there are over 13,000 desalination plants, collectively producing more than 12 billion gallons of water each day, many of them in the Middle East, but the trend is spreading to the United States.38 Camp **Pendleton surfaced** in 2009 **as a potential** desalination **plant location, but the official Marine Corps stance has been hesitant** rather than an eager courtship of the opportunity.39 Indeed, many major Marine bases are in coastal areas and could benefit from SMR/desalination cogeneration plants. Potential **future Marine sites** like Guam could undeniably benefit from such advancements,40 and as the number of reverse osmosis sites increases, the cost per unit will decrease. The CMC has repeatedly explained how the Marine Corps Warfighting Laboratory looked 25 years into the future and believes that, by then, **water will be as precious a commodity as oil**, so the time to start preparing for that dire situation is now.41 Overall, the Navy-Marine Team has made huge strides in the E2 fields, yet much remains to be accomplished. E2 is more than compact fluorescent lightbulbs and protection of sea turtles and tern nests. The warfighting mission will always come first, but combat mission accomplishment and E2 goals are not mutually exclusive; the first can be strengthened through the latter. When considering the Marine Corps’ Service Campaign Plan 2009–2015,42 we should remember that one of the CMC’s seven main focus areas in his planning guidance is to “Posture the Marine Corps for the Future.” A decade ago, some discussed the “Revolution in Military Affairs.” Now is the time to be bold and daring, to recognize that the Marine Corps is not yet green enough. Now is the time to embark on a revolution in environmental and energy affairs. Our natural, and national, security depends on it.43 “What the Navy and Marine Corps are doing now is great, but I am here to encourage you and us to go farther—to dream what might be rather than to simply accept what is. Bold steps are in our nature as Americans and what make us a great nation; no one has ever gotten anything big done by being timid.”

**Domestic military demonstration spills-over**

**Galloway 10**

**(**Brigadier General Gerald E, Former Dean of the Academic Board, US Military Academy and Dean of the Faculty and Academic Programs, Industrial College of the Armed Forces, "On the Need for Creative Energy Solutions", Summer, www.cna.org/sites/default/files/research/WEB%2007%2027%2010%20MAB%20Powering%20America%27s%20Economy.pdf)

Based on the progress made in technology, and on the findings of a study he chaired for the National Academies, General **Galloway believes it may be time for the Army to revisit** the initiative and consider paradigm shifting technologies like **sm**all, modular nuclear reacto**rs**. “In 1999, our report on logistics for the future Army recommended looking once again into small nuclear plants. It found that now there are additional benefits, **like producing hydrogen for fuel cells.** Today, small nuclear reactors are being marketed in the U.S. It’s probably time to think more about this,” General Galloway says. “No one’s envisioned bringing them out in combat zones, but they could provide energy in theater at large staging areas.” General **Galloway sees a special role for DOD in demonstrating these reactors in the U**nited **S**tates. “The challenge at many military facilities is that they’re tied to the grid. We’ve seen the grid go down. At the same time, energy demands are rising. Putting a small reactor on a military installation not only provides a reliable and sustainable power source and a test bed to define its long term utility, but also **places the plant in a secure location**. Within the United States, **it’s hard to find a more physically secure place than a military installation,” says** General **Galloway**. “**If the tests go well on bases in the United States**, these **small reactors could be used to support overseas military operations** or disaster recovery activities.”

**Water assistance vital to effective public diplomacy—key to combat perception of American foreign policy as militarized**

**Seib, 10**

(Professor of journalism and public diplomacy and director of the Center on Public Diplomacy-USC, Considering Water Diplomacy, 6/29, http://www.huffingtonpost.com/philip-seib/considering-water-diploma\_b\_629487.html)

The vitality and seriousness with which the institute addresses such issues is a reminder **that water-related assistance is an underused tool of public diplomacy**. Rather than an "advertising" approach to public diplomacy ("We are wonderful! Love us!"), water diplomacy answers a crucial question often asked by recipients of public diplomacy efforts but just as often ignored by public diplomacy planners: "What can you do for us?" Throughout the world, few things are more precious than a safe and abundant water supply. **A country that can help another nation improve the availability and quality of water is likely to win friends, regardless of how the respective governments get along**. Water diplomacy is an excellent tool for the United States to use in improving relations with Syria, which is enduring a prolonged drought, and other **countries where the public has been indifferent or even hostile toward American interests, but would welcome water-related assistance.** Public diplomacy does not need to be a unilateral enterprise. Engaging in water diplomacy offers the United States an opportunity to develop international partnerships for creating and delivering public diplomacy programs. A U.S.-Singapore joint venture in this field would enhance both countries' credentials as leaders in improving lives throughout the world, and for the United States it would be an improvement on the go-it-alone approach that characterizes much of its foreign policy. Private sector participation by foundations and corporations should be another facet of such partnerships, and could include funding for research into ways to combat water-borne diseases. Developing the concept of water diplomacy requires an essential, but often neglected, element of public diplomacy: imagination. Too much public diplomacy today has become a process of simply going through the motions in overblown public relations campaigns that misjudge the needs and underestimate the sophistication of global publics. **Actually improving people's lives** is given short shrift, and as a result public diplomacy fails to reach its potential as a means of advancing national interests.

**Public diplomacy key to AFRICOM effectiveness**

**Seib, 9**

(Professor of Public Diplomacy & International Relations-USC, America’s New Approach to Africa: AFRICOM and Public Diplomacy, http://uscpublicdiplomacy.org/CPD\_Perspectives.pdf)

Regardless of what reasons are proffered for AFRICOM’s importance, public diplomacy is often cited as **an essential element of the command’s work**. Ryan Henry, principal deputy undersecretary of defense for policy, has stated that “AFRICOM, at its core, is about public diplomacy, which is **critical to its mission** and how we as a nation compete not only in Africa but in the wider marketplace of ideas concerning governance and security facing key regions, critical indigenous peoples, and global stakeholders throughout the world today. Whether you want to call it ‘soft power’ or ‘smart power,’ or even just ‘the right power,’ the bottom line is we have created, for a variety of reasons, a national security structure that today is currently out of balance and is biased toward the military toolset.” He added: “AFRICOM is a risk-laden experiment on the part of government and the Department of Defense specifically on how to more holistically engage the continent of Africa, a specific region of emerging interest. **And public diplomacy is a fundamental element of its success**. **We cannot continue to pursue 21st century missions** in an information digital network age with bureaucratic constructs and thinking laid out as part of the Industrial Age in the aftermath of World War II.” Despite efforts by Gates and his deputies to assuage **concerns about further militarization of U.S. foreign policy**, such worries **cast a shadow on AFRICOM’s prospects**. As the Barack Obama administration begins, the Pentagon’s role in public diplomacy is still being defined. So too is the American view of Africa and Africa’s perception of America.

**Solves global climate adaptation**

Yackle, 7

(MA -Naval War College, “Global Climate Change: Threat Multiplier for AFRICOM?,” http://www.dtic.mil/dtic/tr/fulltext/u2/a476789.pdf)

Adaptation is not a proactive approach - it is purely reactive. Should the combatant commander fail to start planning for climate change then the response will continue to be a reactive force vice a proactive force. Africa’s population size produces an unprecedented number of people who are competing for the same basic needs – food, water, and shelter. The availability of these necessities is diminishing due in part to global climate change. When access to water, for example, is becoming so scarce, people’s desperation for survival leads to irrational behavior. Darfur is the first climate change war and should provoke planning to mitigate the risks of similar conflicts. History sets a foundation for planning; however, as the situation changes, so must the planning. Water scarcity is now being mitigated through the production of fossil aquifers and wastewater reclamation. More and more conflicts are driven by internal and local pressures. Poverty and instability are changing the national security issues. Climate change is presenting a serious threat to resources that create the world-wide balance that we are accustomed to. It will affect an unprecedented number of people simultaneously. Africa will suffer more than other nations from the effects of climate change, yet it has the least ability to survive by merely adapting. “Climate change could exacerbate current instability in Africa in a number of ways. Droughts, floods, and other effects of climate change could lead to crop failures, massive refugee flows, and significant damage to African economies and societies. The chaos and desperation of these tragedies could help undermine governments, increase civil unrest, and promote extremism in a number of countries.” – General Ward The expansive impact of climate change in Africa will require multinational and multi-agency cooperation, supported by the military range of operations, on a much broader scale than is currently projected. Previous attention to environmental scarcities has been focused at the tactical level. For instance, CJTF-HOA has been involved in the critical tasks of infrastructure reconstruction, drilling wells for water, building roads and renovating schools, and military training to assist in counterterrorism efforts. A recent change, illustrated by the UN’s first climate change brief, has moved the discussion to the national and strategic level. As a result, U.S. leaders are now identifying climate change as a global threat multiplier and recognizing the need to protect national interests as well as state stability throughout Africa. Addressing climate change at both the tactical and national levels is crucial for planning to mitigate the effects; however, the geographic combatant commander at the operational level must also be actively involved. The African commander must be prepared for the predicted changes that will occur as a result of global climate change. The potential for an increased magnitude of humanitarian assistance and disaster relief support is intrinsically linked to controlling instability throughout the region. Environmental scarcity used to be a regional problem; however, the predicted global effects now require it to be considered when planning stability operations. Scarcity also affects the economy and is a source of human migration. A weak government, further weakened into a failed state when unable to cope with climate change effects, will result in regional conflicts and power struggles. Now is the time for AFRICOM to take the initiative and plan for this impending threat. Subsequently, an interagency response is needed for the operations that shape theaters in order to promote stability and peace – Phase Zero operations. Fortunately, AFRICOM has a unique command and control structure that will be partially staffed with senior civilian representation providing capability to plan and execute Phase Zero operations effectively. This structure will enable the combatant commander to engage the government, nongovernment relief agencies, and international assistance agencies to build African government capacity and infrastructure so they will be able to confront global climate change as it occurs. Also, the interagency response will be more effectual within a new Joint Interagency Coordination Group for Climate Change (JIACG-CC). This internal command JIACG-CC would be comprised of personnel from both the Civil-Military Activities and the Military Operations components to cultivate a unity of effort. No additional man-power would be required given that the JIAC-CC would be comprised of personnel currently employed at the command. This new JIAC-CC would be a temporary planning cell formed to fill the void of current direction from a higher authority to plan for climate change. Moreover, this planning will be different in nature to traditional military planning as it does not have a known timeframe. Thus, climate change may happen catastrophically in the short-term or evolve at a more gradual pace. The speed of the change and the extent to which it occurs will necessitate contingencies for both short-range and long-term planning. As such, the planning cell will need to create plans for both timeframes and further define them to separate African geographic regions. Once these plans are created for each region, the planning cell will need continuously update the plans as the onset of climate change dictates. The JIAC-CG **will not only prepare AFRICOM but serve as a learning tool for other geographic commands to emulate**. Furthermore, AFRICOM has the opportunity to learn from and use the initiatives that CJTF-HOA has already developed. The CJTF’s experience and cultural sensitivity will offer immense benefits for the new African command to garner as it becomes operational in its Area of Responsibility. Should CJTF-HOA remain under the U.S. Central Command structure, a coordination cell between the two combatant commanders will need to be created to streamline the effort between the two commands. Lastly, the combatant commander should take advantage of centers such as the Naval War College’s War Gaming Department to exercise the new response plans. Consequently, the African commander’s role in planning for climate change will create a more structured and focused reaction to the effects of climate change. Without prior planning, reactionary chaos will likely be the result and the U.S will have lost a positive step towards acting proactively with its African partner. Although the African combatant commander does not have the formal tasking to plan for the effects of global climate change, taking the initiative to plan for it now will ensure readiness to deal with the catastrophic events predicted. Stability in Africa is important for protecting U.S. strategic and economic interests. In accessing future threats, environmental scarcities have a role in promoting regional tensions and conflict, such as seen in Darfur, coupled with the exportation of terrorism. Moreover, large population migrations and permanent displacement of people will need to be prevented for both economic and political ramifications. Stability on this continent hinges on mitigating the effects of global climate change. A unity of effort generated within the unique African command structure to create a JIATF-Climate Change would effectively fill the interlude from current lack of directed Department of Defense planning for climate change. Accordingly, not only will the time gap be proactively filled, the effects of this new threat will be mitigated. Additionally, the JIACG-CC’s interim structure would ensure multinational, multiagency and military efforts in the African Area of Responsibility are synchronized and implemented with utmost efficiency and effectiveness. Immediate planning will allow for more coordinated and proportional responses to the speed and onset of climate change. In conclusion, pessimism when faced with such an enormous problem may overwhelm, but proactive and timely planning to tackle wicked problems will produce manageable solutions. The AFRICOM combatant commander has the opportunity to proactively plan for a threat that demands a military problem-solving-like approach.

**Extinction**

Romero, 8

(Purple, reporter for ABS-CBN news, 05/17/2008, Climate change and human extinction--are you ready to be fossilized? http://www.abs-cbnnews.com/nation/05/16/08/climate-change-and-human-extinction-are-you-ready-be-fossilized)

**Climate change killed the dinosaurs**. Will it kill us as well? Will we let it destroy the human race? This was the grim, depressing message that hung in the background of the Climate Change Forum hosted on Friday by the Philippine National Red Cross at the Manila Hotel. "Not one dinosaur is alive today. **Maybe someday it will be our fossils that another race will dig up in the future**, " said Roger Bracke of the International Federation of Red Cross and Red Crescent Societies, underscoring his point that **no less than extinction is faced by the human race**, **unless we are able to address global warming** and climate change in this generation. Bracke, however, countered the pessimistic mood of the day by saying that **the human race still has an opportunity to save itself**. This more hopeful view was also presented by the four other speakers in the forum. Bracke pointed out that all peoples of **the world must be involved in** two types of response to the threat of climate change: mitigation and **adaptation. "Prevention" is no longer possible**, according to Bracke and the other experts at the forum, **since climate change is already happening.** Last chance The forum's speakers all noted **the increasing number and intensity of devastating typhoons**--most recently cyclone Nargis in Myanmar, which killed more than 100,000 people--as **evidence that the world's climatic and weather conditions are turning deadly because of climate change.** They also reminded the audience that deadly typhoons have also hit the Philippines recently, particularly Milenyo and Reming, which left hundreds of thousands of Filipino families homeless. World Wildlife Fund Climate and Energy Program head Naderev Saño said that "**this generation [is] the last chance for the human race" to do something and ensure that humanity stays alive in this planet.** According to Saño, while most members of our generation will be dead by the time the worst effects of climate change are felt, our children will be the ones to suffer. How will Filipinos survive climate change? Well, first of all, they have to be made aware that climate change is a problem that threatens their lives. The easiest way to do this – as former Consultant for the Secretariats of the UN Convention on Climate Change Dr. Pak Sum Low told abs-cbnews.com/Newsbreak – is to particularize the disasters that it could cause. Talking in the language of destruction, Pak and other experts paint this portrait of a Philippines hit by climate change: increased typhoons in Visayas, drought in Mindanao, destroyed agricultural areas in Pampanga, and higher incidence rates of dengue and malaria. Sañom said that as polar ice caps melt due to global warming, sea levels will rise, endangering coastal and low-lying areas like Manila. He said Manila Bay would experience a sea level increase of 72 meters over 20 years. This means that from Pampanga to Nueva Ecija, farms and fishponds would be in danger of being would be inundated in saltwater. Sañom added that Albay, which has been marked as a vulnerable area to typhoons, would be the top province at risk. Sañom also pointed out that extreme weather conditions arising from climate change, including typhoons and severe droughts, would have social, economic and political consequences: Ruined farmlands and fishponds would hamper crop growth and reduce food sources, typhoons would displace people, cause diseases, and limit actions in education and employment. Thus, Saño said, while environmental protection should remain at the top of the agenda in fighting climate change, solutions to the phenomenon "must also be economic, social, moral and political." Mitigation Joyceline Goco, Climate Change Coordinator of the Environment Management Bureau of the Department of Environment and Natural Resources, focused her lecture on the programs Philippine government is implementing in order to mitigate the effects of climate change. Goco said that the Philippines is already a signatory to global agreements calling for a reduction in the "greenhouse gasses"--mostly carbon dioxide, chloroflourocarbons and methane--that are responsible for trapping heat inside the planet and raising global temperatures. Goco said the DENR, which is tasked to oversee and activate the Clean Development Mechanism, has registered projects which would reduce methane and carbon dioxide. These projects include landfill and electricity generation initiatives. She also said that the government is also looking at alternative fuel sources in order do reduce the country's dependence on the burning of fossil fuels--oil--which are known culprits behind global warming. Bracke however said that mitigation is not enough. "The ongoing debate about mitigation of climate change effects is highly technical. It involves making fundamental changes in the policies of governments, making costly changes in how industry operates. All of this takes time and, frankly, we're not even sure if such mitigation efforts will be successful. In the meantime, while the debate goes on, the effects of climate change are already happening to us." Adaptation **A few nations and communities have already begun adapting their lifestyles to cope with the effects of climate change. In Bangladesh, farmers have switched to raising ducks** instead of chickens because the latter easily succumb to weather disturbances and immediate effects, such as floods. **In Norway, houses with elevated foundations have been constructed** to decrease displacement due to typhoons. In the Philippines main body for fighting climate change, the Presidential Task Force on Climate Change, (PTFCC) headed by Department on Energy Sec. Angelo Reyes, has identified emission reduction measures and has looked into what fuel mix could be both environment and economic friendly. The Department of Health has started work with the World Health Organization in strengthening its surveillance mechanisms for health services. However**, bringing information** hatched from PTFCC’s studies down **to** and **crafting an action plan for adaptation** with the communities in the barangay level **remains a challenge.** Bracke said that the Red Cross is already at the forefront of efforts to prepare for disasters related to climate change. He pointed out that since the Red Cross was founded in 1919, it has already been helping people beset by natural disasters. "The problems resulting from climate change are not new to the Red Cross. The Red Cross has been facing those challenges for a long time. However, the frequency and magnitude of those problems are unprecedented. This is why the Red Cross can no longer face these problems alone," he said. Using a medieval analogy, Bracke said that the Red Cross can no longer be a "knight in shining armor rescuing a damsel in distress" whenever disaster strikes. He said that disaster preparedness in the face of climate change has to involve people at the grassroots level. "The role of the Red Cross in the era of climate change will be less as a direct actor and increase as a trainor and guide to other partners who will help us adapt to climate change and respond to disasters," said Bracke. PNRC chairman and Senator Richard Gordon gave a picture of how the PNRC plans to take climate change response to the grassroots level, through its project, dubbed "Red Cross 143". Gordon explained how Red Cross 143 will train forty-four volunteers from each community at a barangay level. These volunteers will have training in leading communities in disaster response. Red Cross 143 volunteers will rely on information technology like cellular phones to alert the PNRC about disasters in their localities, mobilize people for evacuation, and lead efforts to get health care, emergency supplies, rescue efforts, etc.

**Water scarcity causes wars in asia**

Nitish **Priyadarshi 12**, lecturer in the department of environment and water management at Ranchi University in India, “War for water is not a far cry”, June 16, <http://www.cleangangaportal.org/node/44>

**Water stress is set to become Asia’s defining crisis of the twenty-first century, creating obstacles to** continued rapid economic **growth**, **stoking interstate tensions** over shared resources, **exacerbating** long time **territorial disputes, and imposing** further **hardships on the poor**. Asia is home to many of the world’s great rivers and lakes, but **its huge population , pollution and exploding economic and ag**ricultural **demand for water make it the most water-scare continent** on a per capita basis. Many of **Asia’s water sources cross national boundaries, and as less and less water is available, international tensions will rise**. **The poor management of river basins, environmentally unsustainable irrigation practices, an overuse of groundwater, and the contamination of water sources have all helped aggravate Asian water woes**. **The over exploitation of subterranean water in the large parts of the Asia has resulted in a rapidly falling groundwater saturation level**- known as the water table. In the Gangetic delta, wells have tapped into naturally occurring arsenic deposits, causing millions of people in Bangladesh, and Eastern India including Jharkhand and Bihar to be exposed to high levels of poisonous arsenic in drinking water and staple agricultural products like rice. In some Asian coastal areas, the **depletion of groundwater has permitted saline seawater to flow in to replace the freshwater that has been extracted**. **The Ganga**, which is virtually synonymous with Indian civilisation, **is dying**. **Pollution, over-extraction of water, emaciated tributaries and climatic changes are killing the mighty river**, on whose fecund plains live one in 12 people of this planet. **The Ganga basin makes up** almost **a third of India's land area** and its rich soil is home to millions of people. However, **indiscriminate extraction of water with modern tube wells from the river as well as its basin, coupled with the damming of its tributaries for irrigation, have seriously reduced its flow. Climate change has added to the threat**. **Rivers are the lifeblood of the Bangladesh economy and social life**. Its cultural life is also deeply related to rivers. It is extremely unfortunately that **its three main rivers**, Ganges-Padma, Brahmaputra-Jamuna and Surma-Meghna **are dying**. As per a survey of the Bangladesh Water Development Board (BWDB), there are three hundred and ten rivers in Bangladesh. Out of these fifty-seven are border rivers, the condition of one hundred and seventy five is miserable, and sixty five are almost dead. Eighty percent of the rivers lack proper depth. The latest study reveals that one hundred and seventeen rivers are either dead or have lost navigability . Such rivers/canals include Brahamaputra, Padma, Mahananda, Gorai, Meghna, Titas, Gomati, Kushiara, Dhaleswari, Bhairab, Sitalksha, Turag etc. As per a report of BWDB, India is controlling the water of 57 rivers along with the Farakka barrage. Because of inadequate facilities for dredging, these rivers have become canals. Additionally, India has withdrawn water of several rivers including Surma, Kushiara and Mahananda. Sluice gates have been constructed on the rivers Senoa, Jamuna, Panga, Pan, Hatoori and Sui (situated near Panchagarh). Apart from the scourge of Farakka barrage, a new dam, named Tipaimukh dam, is under construction in India. **Asia will continue to have the world’s largest number of people without basic or adequate access to water**. **The Asian water sector is plagued by serious problems, including inadequate infrastructure and poor system maintenance, financially strapped utilities, low-cost recovery, growing pollution, watershed degradation, and unsustainable groundwater extraction**. Owing to leaks and system inefficiencies, **a sizable portion of the water supply is lost before reaching the consumer**. **As water distress intensifies and global warming accelerates, local, national, and interstate disputes over water are likely to become endemic in Asia**. **Water**, for its part, **could trigger increased conflicts within and between states, and open new political disputes in Asia**. **Water shortages, likely to be aggravated by fast-rising use and climate change, pose a potential threat to political stability, economic modernization, public health, food security, and internal cohesion** in a number of Asian states. A study of Asia’s biggest rivers-the Indus, the Brahmaputra, the Yangtze, the Yellow, and the Ganges-by different experts has found that the “ upstream snow and ice reserves of these basins-important in sustaining seasonal water availability- are likely to be affected substantially by climate change,” although the extent of impact will vary from basin to basin.

**Nuclear war**

**Campbell et al 8** (Kurt M, Assistant Secretary of State for East Asian and Pacific Affairs, Dr. Campbell served in several capacities in government, including as Deputy Assistant Secretary of Defense for Asia and the Pacific, Director on theNational Security Council Staff, previously the Chief Executive Officer and co-founder of the Center for a New American Security (CNAS), served as Director of the Aspen Strategy Group and the Chairman of the Editorial Board of the Washington Quarterly, and was the founder and Principal of StratAsia, a strategic advisory company focused on Asia, rior to co-founding CNAS, he served as Senior Vice President, Director of the International Security Program, and the Henry A. Kissinger Chair in National Security Policy at the Center for Strategic and International Studies, doctorate in International Relation Theory from Oxford, former associate professor of public policy and international relations at the John F. Kennedy School of Government and Assistant Director of the Center for Science and International Affairs at Harvard University, member of Council on Foreign Relations and  International Institute for Strategic Studies, “The Power of Balance: America in iAsia” June 2008, <http://www.cnas.org/files/documents/publications/CampbellPatelSingh_iAsia_June08.pdf>)

Asian *investment* is also at record levels. Asian countries lead the world with unprecedented infra­structure projects. With over $3 trillion in foreign currency reserves, Asian nations and businesses are starting to shape global economic activity. Indian firms are purchasing industrial giants such as Arcelor Steel, as well as iconic brands of its once-colonial ruler, such as Jaguar and Range Rover. China’s Lenovo bought IBM’s personal computer We call the transformations across the Asia-Pacific the emergence of “iAsia” to reflect the adoption by countries across Asia of fundamentally new stra­tegic approaches to their neighbors and the world. **Asian nations are pursuing their interests with real power in a period of** both **tremendous potential and** great **uncertainty**. iAsia is: *Integrating:* iAsia includes increasing economic interdependence and a flowering of multinational forums to deal with trade, cultural exchange, and, to some degree, security. *Innovating:* iAsia boasts the world’s most successful manufacturing and technology sectors and could start taking the lead in everything from finance to nanotech to green tech. *Investing:* Asian nations are developing infrastruc­ture and human capital at unprecedented rates. But **the continent remains plagued by: Insecurity: Great-power rivalry is alive in Asia. Massive military investments along with historic suspicions and contemporary territorial and other conflicts make war in Asia plausible**. Instability: **From environmental degradation to violent extremism to trafficking in drugs, people, and weapons, Asian nations have much to worry about.** *Inequality:* Within nations and between them, **inequality in Asia is more stark than anywhere else in the world. Impoverished minorities in countries like India and China, and the gap in governance and capacity within countries**, whether as back­ward as Burma or as advanced as Singapore, **present unique challenges**. A traditional approach to Asia will not suffice if the United States is to both protect American interests and help iAsia realize its potential and avoid pitfalls. business and the Chinese government, along with other Asian financial players, injected billions in capital to help steady U.S. investment banks such as Merrill Lynch as the American subprime mortgage collapse unfolded. Chinese investment funds regional industrialization, which in turn creates new markets for global products. Asia now accounts for over 40 percent of global consumption of steel 4 and China is consuming almost half of world’s available concrete. 5 Natural resources from soy to copper to oil are being used by China and India at astonishing rates, driving up commodity prices and setting off alarm bells in Washington and other Western capitals. Yet **Asia is not a theater at peace.** On average, between **15 and 50 people die every day from causes tied to conflict, and suspicions rooted in rivalry and nationalism run deep. The continent harbors every traditional and non-traditional challenge of our age: it is a cauldron of religious and ethnic tension; a source of terror and extrem­ism; an accelerating driver of the insatiable global appetite for energy; the place where the most people will suffer the adverse effects of global climate change; the primary source of nuclear proliferation; and the most likely theater on Earth for a major conventional confrontation and even a nuclear conflict.** Coexisting with the optimism of iAsia are the ingredients for **internal strife, non-traditional threats like terrorism, and traditional interstate conflict, which are all magnified by the risk of miscalculation or poor decision-making**.

**Water scarcity also causes Indo-Pak nuclear war.**

**Zahoor ‘11**

(Musharaf, is researcher at Department of Nuclear Politics, National Defence University, Islamabad, “Water crisis can trigger nuclear war in South Asia,” <http://www.siasat.pk/forum/showthread.php?77008-Water-Crisis-can-Trigger-Nuclear-War-in-South-Asia>, AM)

**South Asia is among one of those regions where water needs are growing disproportionately to its availability**. **The high increase in population** besides large-scale cultivation **has turned South Asia into a water scarce region.** The two nuclear neighbors **Pakistan and India share the waters of Indus Basin**. All the major rivers stem from the Himalyan region and pass through Kashmir down to the planes of Punjab and Sindh empty into Arabic ocean. It is pertinent that **the strategic importance of Kashmir**, **a source of all major rivers, for Pakistan and symbolic importance of Kashmir for India are maximum list positions. Both** the **countries have fought two major wars** in 1948, 1965 and a limited war in Kargil specifically on the Kashmir dispute. Among other issues, **the newly born states fell into water sharing dispute right after their partition**. Initially under an agreed formula, Pakistan paid for the river waters to India, which is an upper riparian state. After a decade long negotiations, both the states signed Indus Water Treaty in 1960. Under the treaty, India was given an exclusive right of three eastern rivers Sutlej, Bias and Ravi while Pakistan was given the right of three Western Rivers, Indus, Chenab and Jhelum. The tributaries of these rivers are also considered their part under the treaty. It was assumed that the treaty had permanently resolved the water issue, which proved a nightmare in the latter course. India by exploiting the provisions of IWT started wanton construction of dams on Pakistani rivers thus scaling down the water availability to Pakistan (a lower riparian state). The treaty only allows run of the river hydropower projects and does not permit to construct such water reservoirs on Pakistani rivers, which may affect the water flow to the low lying areas. **According to the statistics of Hydel power Development Corporation of Indian Occupied Kashmir, India has a plan to construct 310 small, medium and large dams in the territory**. India has already started work on 62 dams in the first phase. **The cumulative dead and live storage of these dams will be so great that India can easily manipulate the water of Pakistani rivers**. **India has set up a department called the Chenab Valley Power Projects to construct power plants on the Chenab River in occupied Kashmir**. **India is also constructing three major hydro-power projects on Indus River** which include Nimoo Bazgo power project, Dumkhar project and Chutak project. On the other hand, it has started Kishan Ganga hydropower project by diverting the waters of Neelum River, a tributary of the Jhelum, in sheer violation of the IWT. **The gratuitous construction of dams by India has created serious water shortages in Pakistan.** The construction of Kishan Ganga dam will turn the Neelum valley, which is located in Azad Kashmir into a barren land**. The water shortage will not only affect the cultivation but it has serious social, political and economic ramifications for Pakistan**. The farmer associations have already started protests in Southern Punjab and Sindh against the non-availability of water. These protests are so far limited and under control. The **reports of international organizations suggest** that the **water availability in Pakistan will reduce further in the coming years**. **If the situation remains unchanged**, the **violent mobs of villagers across the country will be a major law and order challenge** for the government. **The water shortage has also created mistrust among the federative units**, which is evident from the fact that the President and the Prime Minister had to intervene for convincing Sindh and Punjab provinces on water sharing formula. The Indus River System Authority (IRSA) is responsible for distribution of water among the provinces but in the current situation it has also lost its credibility. **The provinces often accuse each other of water theft.** In the given circumstances, Pakistan desperately wants to talk on water issue with India. **The meetings between Indus Water Commissioners of Pakistan and India have so far yielded no tangible results**. The recent meeting in Lahore has also ended without concrete results. India is continuously using delaying tactics to under pressure Pakistan. The Indus Water Commissioners are supposed to resolve the issues bilaterally through talks. The success of their meetings can be measured from the fact that Pakistan has to knock at international court of arbitration for the settlement of Kishan Ganga hydropower project. **The recently held foreign minister level talks between both the countries ended inconclusively in Islamabad**, **which only resulted in heightening the mistrust and suspicions. The water stress in Pakistan is increasing day by day**. The construction of dams will not only cause damage to the agriculture sector but India can manipulate the river water to create inundations in Pakistan. **The rivers in Pakistan are also vital for defense during wartime**. The control over the water will provide an edge to India during war with Pakistan. **The failure of diplomacy,** **manipulation** of IWT provisions by **India and growing water scarcity in Pakistan** **and its social, political and economic repercussions for the country** **can lead both the countries toward a war**. The **existent A-symmetry between the conventional forces of both the countries will compel the weaker side to use nuclear weapons** **to prevent the opponent from taking any advantage of the situation**. Pakistan's nuclear programme is aimed at to create minimum credible deterrence. **India has a declared nuclear doctrine which intends to retaliate massively in case of first strike by its' enemy**. In 2003, India expanded the operational parameters for its nuclear doctrine. Under the new parameters, it will not only use nuclear weapons against a nuclear strike but will also use nuclear weapons against a nuclear strike on Indian forces anywhere. **Pakistan has a draft nuclear doctrine**, which consists on the statements of high ups. Describing the nuclear thresh-hold in January 2002, **General Khalid Kidwai**, the head of Pakistan's Strategic Plans Division, in an interview to Landau Network, **said that Pakistan will use nuclear weapons in case India occupies large parts of its territory,** **economic strangling by India**, **political disruption and if India destroys Pakistan's forces.** The **analysis of the ambitious nuclear doctrines of both** the **countries** clearly **points out that any military confrontation in the region can result in a nuclear catastrophe**. **The rivers flowing from Kashmir are Pakistan's lifeline,** **which are essential for the livelihood of 170 million people of the country and the cohesion of federative units. The failure of dialogue will leave no option but to achieve the ends through military means.**

**No diplomacy or institutions**

Adam **Radin 10**, masters in security studies from the naval postgraduate school, “the security implications of water: prospects for instability or cooperation in south and central asia”, March, <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA518674>

**Water**, an issue so important to numerous facets of each state’s economy and overall stability, **must not be left to loosely observed and nonbinding agreements**. Tajikistan has even gone as far as to appeal to the United Nations General Assembly to focus on the “Central Asia water dilemma.”142 **In a region that is still developing, and where the government’s survival rely more on its relations with it people versus its regional neighbors, domestic needs will continue to trump international cooperation**. As Linn notes in his plan, the need for global actors to take an active role is likely needed in order for sustained cooperation. Additionally, this also provides an opportunity for Russia to actively insert itself through diplomacy and infrastructural investments, seeing that they still consider the CARs under their sphere of influence.143

The chapter presents a contrasting case study to South Asia, as **in Central Asia water is not viewed as a regional security issue, but in terms of fulfilling short-term domestic needs. Without the looming threat of conflict or significant retribution from regional neighbors, cooperation is consistently undervalued and abandoned once domestic pressures increase**. The problem with this pattern is that **resources will likely continue to deteriorate** and the CARs will continue to be dependent on each other to provide water and energy. Without sustained and flexible cooperation, **the region** at the very least **will see greater stresses on government to provide for their populations, leading to domestic and potential regional instability**.

**Desal has to double every decade**

**Hines et al ’11**

Wesley is associate professor of nuclear engineering at the Univeristy of Tennessee and performed a study analyzing the effects of desalination with six other scientists, “Advanced Instrumentation and Control Methods for Small and Medium Reactors with IRIS demonstration,” <http://www.osti.gov/bridge/servlets/purl/1015813-7MUuYb/1015813.pdf>

In Figure 1.1, countries which will face “economic water shortages” (i.e. inadequacy of¶ supply and demand) are shown. **According to the market survey performed by the World¶ Resources Institute** on the future growth of seawater desalination, **the worldwide demand for¶ desalination is expected to double approximately every 10 years in the foreseeable future**. Most¶ of the demand would arise in the Arabian Gulf and North African regions, but this is likely to¶ expand to other areas.

**SMRs solve—**

**Scalability**

**IAEA 7**, “Economics of Nuclear Desalination: New Developments and Site Specific Studies”, July, <http://www-pub.iaea.org/MTCD/publications/PDF/te_1561_web.pdf>

Seventy percent of the planet is covered with water, but only 2.5% of that is fresh water. Nearly 70% of this fresh water is frozen in the icecaps of Antarctica and Greenland. Most of the rest is in the form of soil moisture or in deep inaccessible aquifers or comes in the form of heavy rains and floods that are difficult to contain and exploit. Consequently, **only less than 0.008%** (about 70 000 km3) **of the world’s water is readily accessible for direct human use, and even that is very unevenly distributed**. Recent statistics show that currently **2.3 billion people live in water-stressed areas and among them 1.7 billion live in water-scarce areas, where the water availability per person is less than 1000 m3/year**. In fact, **the situation is expected to worsen further since, by 2025, the number of people suffering from water stress or scarcity could swell to 3.5 billion, out of which 2.4 billion would live in water-scarce regions. Water scarcity is a global issue**. Every year new countries are affected by growing water problems. It is for this reason that the Millennium Declaration by UN General Assembly in 2000 set up a target to halve, by the year 2015, the world population, which is unable to reach, or to afford, safe drinking water. Vision 21: shared vision for Hygiene, Water Supply and Sanitation, has a target to provide water, sanitation and hygiene for all by 2025. Better water conservation, water management, pollution control and water reclamation are all part of the integrated solution to projected water stresses. So too are new sources of fresh water, including the desalination of seawater. **Desalination technologies have been well established since the mid-20th century and widely deployed in the Middle East and North Africa. The contracted capacity of desalination plants has increased steadily since 1965** and is now about 36 million m3/day worldwide, as shown in Figure 1. **This capacity could cater to world’s population roughly 6 litres a day per capita of fresh potable water. If this capacity were available to 1.5 billion in the world without direct access to drinking water, it would provide approximately 20 litres/day/capita**. Large scale commercially available desalination processes can generally be classified into two categories: (a) distillation processes that require mainly heat plus some electricity for ancillary equipment, and (b) membrane processes that require only electricity. In the first category (distillation) there are two major processes: multi-stage flash (MSF) and multi-effect distillation (MED). In both processes, seawater is heated; the steam that evaporates is condensed and collected as freshwater; and the residual brine is discharged. In the second category (membranes) is the reverse osmosis process (RO), in which pure water passes from the high-pressure seawater side of a semi-permeable membrane to the low-pressure freshwater side. The pressure differential must be high enough to overcome the natural tendency for water to move from the low concentration freshwater side of a membrane to the high concentration seawater side in order to balance osmotic pressures. The energy for the desalination plants is generally supplied in the form of either steam or electricity. Conventional fossil fuel-powered plants have normally been utilized as the primary sources but their intensive use raises increasing environmental concerns, specifically in relation to greenhouse gas emissions (Section 1.3.3). The depleting sources and the future price uncertainty of the fossil fuels and their better use for other vital industrial applications are also the factors to be considered. 1.3. THE ROLE OF NUCLEAR POWER IN DESALINATION The world energy requirements are presently met from oil, coal, gas, hydro, nuclear and renewable energies in that order as shown in Table 1. **It is now universally recognized that there will be an increase in the world’s requirement for electricity over the next few decades. The present trend towards meeting this demand includes the building of fossil fuel plants**, particularly combined cycle gas fired plants. However, **the spiralling increase in** greenhouse gas (**GHG**) **emissions has resulted in** setting the **emission targets** in international meetings held at Toronto, Rio de Janeiro and Kyoto. The IAEA predicts that the GHG emissions would be 36-50% higher by 2010 compared to 1990 levels. Many analysts, therefore, feel that **the only viable alternative to fossil fuels is nuclear energy to reduce the rate of increase of GHG**, particularly, carbon dioxide. Yet **another incentive for nuclear power is to maintain diversity of supply**. **A national strategy limited to one particular form of energy (fossil fuels) will be vulnerable to increased fuel costs and pressures from exporting countries**. **Nuclear power is a proven technology, which has provided more than 16% of world electricity supply in over 30 countries. More than ten thousand reactor-years of operating experience have been accumulated over the past 5 decades**. There are many reasons which favour a possible revival of the nuclear power production in the years to come. It is thus expected that this revival would also lead to an increased role of nuclear energy in non-electrical energy services, which, at the moment, are almost entirely dominated by fossil energy sources. Among various utilization of nuclear energy for non-electrical products, using it for the production of freshwater from seawater (nuclear desalination) has been drawing broad interest in the IAEA Member States as a result of acute water shortage issues in many arid and semi-arid zones worldwide. With technical co-ordination or support of the IAEA, several **demonstration programs of nuclear desalination are** also **in progress** in several Member States to confirm its technical and economical viability under country-specific conditions **The desalination of seawater using nuclear energy is a feasible option to meet the growing demand for potable water. Over 175 reactor-years of operating experience on nuclear desalination have already been accumulated worldwide**. 1.3.1. Nuclear desalination In the IAEA terminology, nuclear desalination is defined to be the production of potable water from seawater in a facility in which a nuclear reactor is used as the source of energy for the desalination process. Electrical and/or thermal energy may be used in the desalination process on the same site. The facility may be dedicated solely to the production of potable water, or may be used for the generation of electricity and production of potable water, in which case only a portion of the total energy output of the reactor is used for water production. The design approaches for a nuclear desalination plant are essentially derived from those of the nuclear reactor alone, with some additional aspects to be considered in the design of a desalination plant and its integration with the nuclear system. **All nuclear reactor types can provide the energy required by the various desalination processes**. In this regard, it has been shown that Small and Medium Reactors (**SMRs**) **offer the largest potential as coupling options to nuclear desalination systems in developing countries**. The development of innovative reactor concepts and fuel cycles with **enhanced safety features as well as their attractive economics are expected to improve the public acceptance and further the prospects of nuclear desalination**. The coupling with nuclear system is not difficult technically but needs some consideration in (a) avoiding cross-contamination by radioactivity, (b) providing backup heat or power sources in case the nuclear system is not in operation (e.g. for refuelling and maintenance), (c) incorporation of certain design features, minimising the impact of the thermal desalination systems’ coupling to the nuclear reactors (Section 1.6). 1.3.2. Why nuclear desalination? The International Atomic Energy Agency is a specialized organization of the UN system that seeks to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world. The institutional basis for the IAEA’s involvement in nuclear desalination is in its Statute and Medium Term Strategy. Article II of the IAEA Statute provides that: “ The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world”. This refers implicitly to nuclear desalination as an option for the use of nuclear technologies. The same applies to the Article III of the Statute, which authorizes the IAEA: “ To encourage and assist research on, and development and practical application of, atomic energy for peaceful uses throughout the world….”; (Article III, A.1); and “To foster the exchange of scientific and technical information on peaceful uses of atomic energy.” (Article III, A.3). In addition, Objective A.3 of the Agency’s Medium Term Strategy requires the Agency: “ To support and facilitate the development of new and emerging applications of nuclear technologies by co-generation and heat applications, including seawater desalination”. Request of assessing feasibility of using nuclear energy for seawater desalination was first made by the five North African countries to the IAEA in 1989 and the General Conference adopted its resolution to resume the study. These countries are located in semi-arid zones and already suffer from water shortages. In recent years, **interests have been** also been **indicated by** Member States in **South and South East Asia for the feasibility, as well as the demonstration, of nuclear desalination projects**. The issue has since then been repeatedly stressed at the General Conference (Committee on the Whole) and supported by many Member States including most members of Group-77. **The support stems not only from their expectation of its possible contribution to the freshwater issue but** has **also** been motivated by a variety of reasons that include: **the economic competitiveness of nuclear desalination in areas lacking cheap hydropower or fossil fuel resources, energy supply diversification, conservation of fossil fuel resources and spin-off effects of nuclear technology for industrial development**. Looking to the future, there are several reasons for focusing now on expanding nuclear power’s contribution to desalination. Apart from the expanding demand for freshwater and the increasing concern about GHG emissions and pollution from fossil fuels, **there is a renewed and growing emphasis on small** and medium sized nuclear **reactors**, **and this is particularly important for desalination because the countries most in need of new sources of freshwater often have limited industrial infrastructures and relatively weaker electricity grids**. **The size of the grid limits the possibilities for integrating a co-generating nuclear power plant into the grid to supply the electricity market, in addition to meeting the energy requirements of a desalination plant**. **The largest power unit that can be integrated into an electricity grid must not exceed about 10-20 % of the total grid capacity**. Of course, **smaller nuclear reactors would be more appropriate for remote areas that are not suitable for connections to the grid**. For nuclear desalination to be attractive in any given country, two conditions have to be satisfied simultaneously: **a lack of water and the ability to use nuclear energy for desalination**. In most regions, only one of the two is present. Both **are present** for example **in China**, the Republic of **Korea, India and Pakistan**. **These regions already account for almost half the world’s population, and thus represent a potential long term market for nuclear desalination**. The market will expand further to the extent that regions with high projected water needs, such as the Middle East and North Africa, increase their nuclear expertise and capabilities. 1.3.3. Environmental impact of desalination by fossil fuelled energy sources Desalination is an energy intensive process. **A future desalination strategy based only on the use of fossil fuelled systems is not sustainable: Fossil fuel reserves are finite and must be conserved for more important uses** such as transport, petrochemical industry etc. Besides, **the demands for desalted water would continue increasing as population grows and standards of living improve**. **Conservation measures** such as the modernisation of water networks to minimise leakages, the recycling of used water etc. will certainly reduce the future water demands slightly but they **would not be able to halt the dissemination of desalination plants and consequently of the fossil fuelled based systems for the production of needed electricity and heat**. The following paragraphs illustrate the damaging consequences of such a policy by taking the example of the Mediterranean region. Following the recent “Blue Plan” [2], the total available natural water resources (1), based on the statistics from 1990 to 1998, in the principle countries of the Mediterranean region, are as shown in Table 2. The projected demands (3) for the year 2025 [31] are also included in Table 1. It is obvious that available natural water resources would rather decrease in 2025 because of increased pollution, over exploitation and other human activities. However, to keep matters simple, it would be supposed that they would remain at the same level as in 1998. It can be observed that, in 2025, the total projected water deficit (balance) in the Mediterranean region would of the order of 294 km3/per year. Not all this required capacity would be met by desalination plants. Current contribution of desalination is of the order of 1 to 2 %. If it is supposed that in 2025, this contribution would be about 2.5 %, then the total required desalting capacity would be 7.3 km3/year (20.1 million m3/day). According to the EC ExternE study2, the total emissions of GHG per MW(e).h of electricity produced by representative fossil fuelled power plants in France, are as presented in Table 3. The specific heat and electricity consumptions of three main desalination plants are given in Table 4, [3]. The data presented in the above Tables allows to calculate the approximate3 total GHG emissions produced by the fossil fuelled plants and the three desalination plants. Results for a total desalting capacity of 20.1 million m3/day are presented in Table 5. It can thus be concluded that **for a desalting capacity of 20.1 million m3/day in the Mediterranean region alone, required in 2025, one would produce**, depending upon the energy source and the desalination process used, 13 to **264 million tonnes/year of CO2**. 1350 to **1 310 000 tonnes/year of SOx**. 21 100 to **540 000 tonnes/year of NOx**. 1190 to **40 000 tonnes/year of particles**. The potential levels of GHG and particle emissions on the world scale could then be more than double these figures. **These could naturally be avoided through the use of nuclear energy**.

**Key to deescalate conflicts**

Palley ‘11

Reese Palley, The London School of Economics, 2011, The Answer: Why Only Inherently Safe, Mini Nuclear Power Plans Can Save Our World, p. 168-71

The third world has long been rent in recent droughts, by the search for water. In subsistence economies, on marginal land, water is not a convenience but a matter of life and death. As a result small **wars have been fought, rivers diverted, and wells poisoned in what could be a warning of what is to come as industrialized nations begin to face failing water supplies.** Quite aside from the demand for potable water is the dependence of enormous swaths of industry and agriculture on oceans of water used for processing, enabling, and cleaning a thousand processes and products. It is interesting to note that fresh water used in both industry and agriculture is reduced to a nonrenewable resource as agriculture adds salt and industry adds a chemical brew unsuitable for consumption. More than one billion people in the world already lack access to clean water, and things are getting worse. Over the next two decades, the average supply of water per person will drop by a third, **condemning millions** of people **to** waterborne **diseases** and an avoidable premature death.81 So **the stage is set for water access wars between** the **first and the third worlds**, between **neighbors** downstream of supply, between **big industry** and big agriculture, between **nations**, between **population** centers, and ultimately between you and the people who live next door for an already inadequate world water supply that is not being renewed. **As populations inevitably increase, conflicts will intensify**.82 It is only by virtue of the historical accident of the availability of nuclear energy that humankind now has the ability to remove the salt and other pollutants to supply all our water needs. The problem is that **desalination is an intensely local process**. Some localities have available sufficient water from renewable sources to take care of their own needs, but not enough to share with their neighbors, and it **is here that the scale of nuclear energy production must be defined locally.** Large scale 1,000 MWe plants can be used to desalinate water as well as for generating electricity However we cannot build them fast enough to address the problem, and, if built they would face the extremely expensive problem of distributing the water they produce. Better, much better, would be to use small desalinization plants sited locally. Beyond desalination for human use is the need to green some of the increasing desertification of vast areas such as the Sahara. Placing twenty 100 MWe plants a hundred miles apart along the Saharan coast would green the coastal area from the Atlantic Ocean to the Red Sea, a task accomplished more cheaply and quickly than through the use of gigawatt plants.83 This could proceed on multiple tracks wherever deserts are available to be reclaimed. Leonard Orenstein, a researcher in the field of desert reclamation, speculates: If most of the Sahara and Australian outback were planted with fast-growing trees like eucalyptus, the forests could draw down about 8 billion tons of carbon a year—nearly as much as people emit from burning fossil fuels today. As the forests matured, they could continue taking up this much carbon for decades.84 **The use of small, easily transported**, easily **sited**, and walk away **safe nuclear reactors dedicated to desalination is the only answer** to the disproportionate distribution of water resources that have distorted human habitation patterns for millennia. Where there existed natural water, such as from rivers, great cities arose and civilizations flourished. Other localities lay barren through the ages. We now have the power, by means of SMRs profiled to local conditions, not only to attend to existing water shortages but also to smooth out disproportionate water distribution and create green habitation where historically it has never existed. **The endless wars that have been fought**, first over solid bullion gold and then over oily black gold, **can now engulf us in the desperate reach for liquid blue gold. We need never fight these wars again as we now have the nuclear power to fulfill the** biblical **ability to “strike any local rock and have water gush forth**.”

**It’s economically viable**

Gamini **Seneviratne 7**, Nuclear News’s Vienna Correspondent, “Research projects show nuclear

desalination economical”, April, <http://www.ans.org/pubs/magazines/nn/docs/2007-4-3.pdf>

**The desalination of seawater using nuclear power is cost-effective compared with other primary energies, according to researchers in 10 countries** who have studied various options at specific sites in their own countries. **Their findings show nuclear to be** at least **competitive in all cases**. Researchers from Argentina, China, Egypt, France, India, Korea, Pakistan, Russia, Syria, and the United States focused on the economics of producing potable water by using various desalination technologies and energy sources at particular sites. The participants followed an agreed procedure throughout a coordinated research project (CRP), Economics of Nuclear Desalination— New Developments and Site-specific Studies, set up by the International Atomic Energy Agency. The findings of the studies, carried out over three years and ending in November 2006, are included in a technical document (IAEA-TECDOC) already at the printer. “**There is a dire shortage of fresh water for drinking in many countries already**, and when you realize that 70 percent of the planet is covered with water but only 2.5 percent of that is fresh water, it is hardly surprising,” Ibrahim Khamis, who heads the IAEA’s desalination unit, told Nuclear News. He added that **70 percent of** that **fresh water is frozen in the polar icecaps and Greenland, and most of the rest is in soil moisture, inaccessible underground aquifers, or comes as heavy rain that is difficult to capture**. “So only some 0.008 percent, about 70 000 km3, is readily available, and even that is very unevenly distributed.” According to Khamis, **recent statistics show 2.3 billion people living in water stressed areas**, **1.7 billion of them in areas where the availability is on average less than 1000 m3 a year**. **Given human population growth and the increasing demands of industry and ag**riculture, **the projections point to a continuously worsening situation, even if the effects of global warming are not taken into account**. Khamis said he foresaw a time when **nuclear power will be sought for desalination** rather than for electricity generation, at least in some specific regions of the world such as the Middle East. “You can live without electricity for quite a long time; without water, only a matter of days.” The U.S. study, which was undertaken by Argonne National Laboratory (ANL), notes that “**the need for fresh water**, high-purity water, and other grades of water **for** various domestic, **industrial, and ag**ricultural **applications** **is ever increasing in the U**nited **S**tates.” **Demand is driven mainly by population, as well as continuous economic and tech**nological **growth**, and it is predicted that more than **an additional 60 billion m3 of water a year will be needed for municipal and light industrial uses by the year 2020**. An additional 11–19 liters per day per person will be needed to generate hydrogen, should transportation be based mainly on hydrogen-powered vehicles in the future. “**Cogeneration of water and power could offer a major portion of the additional water needed, in addition to providing much needed energy for maintaining sustainable development and growth**,” the ANL report says. The IAEA report says that desalinating seawater is not the only solution under discussion for remedying the water scarcity, but it is an important one. There are essentially two methods: distillation using heat, and the use of membranes and electricity directly. The two main distillation modes, known as multistage flash (MSF) and multieffect distillation (MED), both involve heating seawater to produce steam, followed by evaporation, condensation, and, finally, pure water collection. The method using membranes, which is called reverse osmosis (RO), uses electricity to create a pressure differential across a semipermeable membrane, allowing fresh water to pass through to the low-pressure side, and leaving salty seawater on the high-pressure side. Desalination plant capacity worldwide is close to 40 million m3 today, mostly by distillation using fossil energy, and mostly in the Middle East and North Africa. **Nuclear desalination has so far been exclusively for use within the nuclear power plants themselves**, except at the Soviet-built BN-350 fast reactor in Aktau, Kazakhstan, which supplied potable water to local communities until it was shut down in 1999. Currently, only India supplies nuclear desalinated water outside the plant site. Having earlier used MSF to get plant-use water, it has also integrated RO to the desalination unit at its Kalpakkam pressurized heavy-water reactor (PHWR) in Chenai, and it has begun (experimentally) supplying some water outside the power station. Pakistan has begun a similar project at its Karachi nuclear power plant (KANUPP) to couple a 1600 m3/day MED unit to the nuclear plant, which earlier operated a 454 m3/day RO facility for plant use. **Fresh water is needed for many purposes**. **Saudi Arabia alone already irrigates crops with desalinated water**. A number of countries, notably **Egypt**, the Persian Gulf States, **Israel, Jordan, and Libya, depend on the tech**nology **to maintain tourism**. Khamis said **nuclear desalination has been held back by** two key factors: **economics, and the unavailability of reactors of appropriate size**. The CRP addressed the former, comparing cost performance between reactor plus desalination method combinations. **The perception that nuclear is less cost-effective than other energy sources was repudiated by the studies**. The report says that the country case studies “have shown that in general, the nuclear desalination costs can vary from $0.5 to $0.94/m3 for RO, from $0.6 to $0.96/m3 for MED, and from $1.18 to $1.48/m3 for MSF plants. **All nuclear options are economically attractive as compared with the gas turbine combined-cycle–based desalination systems**, as long as gas prices remain higher than $150/toe [metric tons oil equivalent] or $21/bbl [barrel].”

**Plan accesses a huge export market**

Rosner and Goldberg 11

Robert Rosner, Stephen Goldberg, Energy Policy Institute at Chicago, The Harris School of Public Policy Studies, November 2011, SMALL MODULAR REACTORS –KEY TO FUTURE NUCLEAR POWER GENERATION IN THE U.S., <https://epic.sites.uchicago.edu/sites/epic.uchicago.edu/files/uploads/EPICSMRWhitePaperFinalcopy.pdf>

Previous **studies have documented the potential for a significant export market for U.S. SMRs, mainly in lesser developed countries that do not have the demand or infrastructure to accommodate GW-scale LWRs**. Clearly, the economics of SMR deployment depends not only on the cost of SMR modules, but also on the substantial upgrades in all facets of infrastructure requirements, particularly in the safety and security areas, that would have to be made, and as exemplified by the ongoing efforts in this direction by the United Arab Emirates (and, in particular, by Abu Dhabi). This is a substantial undertaking for these less developed countries. Thus, such applications may be an attractive market opportunity for FOAK SMR plants, even if the cost of such plants may not have yet achieved all of the learning benefits.

**The Department of Commerce has launched the Civil Nuclear Trade Initiative, which seeks to identify the key trade policy challenges and the most significant commercial opportunities.** The Initiative encompasses all aspects of the U.S. nuclear industry, and, as part of this effort, **the Department identified 27 countries as “markets of interest” for new nuclear expansion**. A recent Commerce Department report identified that “**SMRs can be a solution for certain markets that have smaller and less robust electricity grids and limited investment capacity**.” Studies performed by Argonne National Laboratory suggest that **SMRs would appear to be a feasible power option for countries** that have grid capacity of 2,000-3,000 MW. **Exports of SMR technology** also **could play an important role in furthering non-proliferation policy objectives.** **The design of SMR nuclear fuel management systems**, such as encapsulation of the fuel, **may have non-proliferation benefits** that merit further assessment. Also, **the development of an SMR export industry would be step toward a U.S.-centric, bundled reliable fuel services**.

**Solvency**

**Military procurement solves commercial and islanding- avoid regulation**

**Andres and Loudermilk 10**

(Richard B. Andres, Professor of ¶ national Security Strategy at the ¶ national War College and a Senior fellow and energy and environmental ¶ Security and Policy Chair in the Center ¶ for Strategic research, institute for national Strategic Studies, at the national Defense University, Micah J, Research Associate for the Energy & Environmental Security Policy program with the Institute for National Strategic Studies at National Defense University, “Small Reactors and the Military’s Role in Securing America’s Nuclear IndustryPosted” <http://robertmayer.wordpress.com/2010/08/28/small-reactors-and-the-militarys-role-in-securing-americas-nuclear-industryposted/>, SEH)

Unlike private industry, the military does not face the same regulatory and congressional hurdles to constructing reactors and would have an easier time in adopting them for use. By integrating small nuclear reactors as power sources for domestic U.S. military bases, three potential energy dilemmas are solved at the same time. First, by incorporating small reactors at its bases, the military addresses its own energy security quandary. The military has recently sought to “island” its bases in the U.S. -protecting them from grid outages, be they accidental or intentional. The Department of Defense has promoted this endeavor through lowering energy consumption on bases and searching for renewable power alternatives, but these measures alone will prove insufficient. Small reactors provide sufficient energy output to power military installations and in some cases surrounding civilian population centers.¶ Secondly, as the reactors become integrated on military facilities, the stigma on the nuclear power industry will ease and inroads will be created for the adoption of small-scale reactors as a viable source of energy. Private industry and the public will see that nuclear reactors can indeed be utilized safely and effectively, resulting in a renewed push toward the expansion of nuclear power. Although many of the same hurdles will still be in place, a shift in public opinion and a stronger effort by utilities, coupled with the demonstrated success of small reactors on military bases, could prove the catalysts necessary for the federal government and the NRC to take more aggressive action.¶ Finally, while new reactors are not likely in the near future, the military’s actions will preserve, for a while longer, the badly ailing domestic nuclear energy industry. Nuclear power is here to stay around the globe, and the United States has an opportunity to take a leading role in supplying the world’s nuclear energy and reactor technology. With the U.S. nuclear industry dormant for three decades, much of the attention, technology, and talent have concentrated overseas in countries with a strong interest in nuclear technology. Without the United States as a player in the nuclear energy market, it has little say over safety regulations of reactors or the potential risks of proliferation from the expansion of nuclear energy. If the current trend continues, the U.S. will reach a point where it is forced to import nuclear technology and reactors from other countries. Action by the military to install reactors on domestic bases will both guarantee the survival of the American nuclear industry in the short term, and work to solidify support for it in the long run.¶ Ultimately, between small-scale nuclear reactors and the U.S. military, the capability exists to revitalize America’s sleeping nuclear industry and promoting energy security and clean energy production. The reactors offer the ability to power domestic military bases, small towns, and other remote locations detached from the energy grid. Furthermore, reactor sites can house multiple units, allowing for greater energy production – rivaling even large reactors. Small reactors offer numerous benefits to the United States and a path initiated by the military presents a realistic route by which their adoption can be achieved.

**Alternative financing cuts costs and supercharges commercialization**

**Fitzpatrick 11**

Ryan Fitzpatrick, Senior Policy Advisor for Clean Energy at Third Way, Josh Freed, Vice President for Clean Energy at Third Way, and Mieke Eoyan, Director for National Security at Third Way, June 2011, Fighting for Innovation: How DoD Can Advance CleanEnergy Technology... And Why It Has To, content.thirdway.org/publications/414/Third\_Way\_Idea\_Brief\_-\_Fighting\_for\_Innovation.pdf

The DoD has over $400 billion in annual purchasing power, **which means the Pentagon could provide a sizeable market for new technologies**. **This can increase a technology’s scale of production, bringing down costs, and making the product more likely to successfully reach commercial markets**. **Unfortunately**, many potentially significant clean energy **innovations never get to the marketplace, due to a lack of capital during** the development and **demonstration stages. As a result, technologies that could help the military** meet its clean energy security and cost goals **are being abandoned or co-opted by competetors like China** before they are commercially viable here in the U.S. **By focusing its purchasing power on innovative products that will** help **meet its energy goals, DoD can provide** more **secure** and **cost-effective energy to the military—producing tremendous long-term savings**, while also **bringing** potentially **revolutionary technologies to the public**. Currently, many of these **technologies are passed over during** the **procurement** process **because of** higher **upfront costs—even if these technologies can reduce life-cycle costs** to DoD. The Department has only recently begun to consider life-cycle costs and the “fullyburdened cost of fuel” (FBCF) when making acquisition decisions. However, initial reports from within DoD suggest that the methodology for determining the actual FBCF needs to be refined and made more consistent before it can be successfully used in the acquisition process.32 The Department should fast-track this process to better maximize taxpayer dollars. Congressional appropriators— and the Congressional Budget Office—should also recognize the **savings that can be achieved by procuring advanced technologies to promote DoD’s energy goals**, even if these procurements come with higher upfront costs. **Even if the Pentagon makes procurement of emerging clean energy technologies a higher priority, it still faces real roadblocks in developing relationships with the companies that make them. Many clean energy innovations are developed by small businesses or companies that have no previous experience working with military procurement officers. Conversely, many procurement officers do not know the clean energy sector and are not incentivized to develop relationships with emerging clean energy companies**. Given the stakes in developing domestic technologies that would help reduce costs and improve mission success, the Pentagon should develop a program to encourage a better flow of information between procurement officers and clean energy companies—especially small businesses. Leverage Savings From Efficiency and Alternative Financing to Pay for Innovation. **In an age of government-wide austerity and tight** Pentagon **budgets**, current congressional **appropriations are simply not sufficient** to fund clean energy innovation. **Until Congress decides to direct additional resources** for this purpose, the **Defense** Department **must leverage** the money and other **tools it already has** to help develop clean energy. This can take two forms: repurposing money that was saved through energy efficiency programs for innovation and using alternative methods of financing to reduce the cost to the Pentagon of deploying clean energy. For several decades **the military has made** modest **use alternative financing** **mechanisms to fund** clean **energy** and efficiency **projects when appropriated funds were insufficient**. In a 2010 report, GAO found that while only 18% of renewable energy projects on DoD lands used alternative financing, these projects account for 86% of all renewable energy produced on the Department’s property.33 This indicates that **alternative financing can be particularly helpful to DoD in terms of bringing larger and more expensive projects to fruition**. One advanced financing tool available to DoD is **the energy savings performance contract** (ESPC). These agreements **allow DoD to contract a private firm to make upgrades to a building or other facility that result in energy savings, reducing overall energy costs without appropriated funds**. **The firm finances the cost, maintenance and operation of these upgrades and recovers a profit over the life of the contract**. While mobile applications consume 75% of the Department’s energy,34 DoD is only authorized to enter an ESPC for energy improvements done at stationary sites. As such, Congress should allow DoD to conduct pilot programs in which ESPCs are used to enhance mobile components like aircraft and vehicle engines. This could accelerate the needed replacement or updating of aging equipment and a significant reduction of energy with no upfront cost. To maximize the potential benefits of ESPCs, DoD should work with the Department of Energy to develop additional training and best practices to ensure that terms are carefully negotiated and provide benefits for the federal government throughout the term of the contract.35 This effort could possibly be achieved through the existing memorandum of understanding between these two departments.36 The Pentagon should also consider using any long-term savings realized by these contracts for other energy purposes, including the promotion of innovative technologies to further reduce demand or increase general energy security. In addition to ESPCs, **the Pentagon** also **can enter into** extended agreements with utilities to use DoD land to generate electricity, or for the **long-term purchase of energy**. **These** **innovative financing mechanisms**, known respectively as enhanced use leases (EULs) and power purchase agreements (PPAs), **provide a valuable degree of certainty to third party generators**. In exchange, the **Department can leverage its existing resources**—either its land or its purchasing power—**to negotiate lower electricity rates** and dedicated sources of locallyproduced power with its utility partners. **DoD has unique authority among federal agencies to enter extended 30-year PPAs**, **but only for geothermal energy projects and only with direct approval from the Secretary of Defense**. Again, limiting incentives for clean energy generation to just geothermal power inhibits the tremendous potential of other clean energy sources to help meet DoD’s energy goals. **Congress should consider opening this incentive up to other forms of clean energy generation**, including the production of advanced fuels. Also, given procurement officials’ lack of familiarity with these extended agreements and the cumbersome nature of such a high-level approval process, the unique authority to enter into extended 30-year PPAs is very rarely used.37 DoD should provide officials with additional policy guidance for using extended PPAs and Congress should simplify the process by allowing the secretary of each service to approve these contracts. Congress should also investigate options for encouraging regulated utility markets to permit PPA use by DoD. Finally, when entering these agreements, the Department should make every effort to promote the use of innovative and fledgling technologies in the terms of its EULs and PPAs. CON C L U S ION **The Defense Department is in a unique position to foster and deploy innovation in clean energy technologies**. This has two enormous benefits for our military: it will make our troops and our facilities more secure and it will reduce the amount of money the Pentagon spends on energy, freeing it up for other mission critical needs. If the right steps are taken by Congress and the Pentagon, the military will be able to put its resources to work developing technologies that will lead to a stronger fighting force, a safer nation, and a critical emerging sector of the American economy. **The Defense Department has helped give birth to technologies and new economic sectors dozens of times before**. For its own sake and the sake of the economy, **it should make clean energy innovation its newest priority**.

**DoD key**

Glen **Butler**, Lt. Col., 20**11**, Not Green Enough, [www.mca-marines.org/gazette/not-green-enough](http://www.mca-marines.org/gazette/not-green-enough)

**SMRs have relatively low plant cost**, can replace aging fossil plants, and do not emit greenhouse gasses. Some are as small as a “hot tub” and can be stored underground, dramatically increasing safety and security from terrorist threats.25 Encouragingly, in fiscal year 2010 (FY10) the **DoE allocated** $0 to **the U.S. SMR Program**; in FY11, they’ve requested $38.9 million. This **funding is to support** two main activities—**public/private partnerships to advance** SMR **designs and research** **and** development and **demonstrations**. According to the DoE’s website, one of the planned program accomplishments for FY11 is to “collaborate with the Department of Defense (DoD) . . . to assess the feasibility of SMR designs for energy resources at DoD installations.”26 The Marine Corps should vigorously seek the opportunity to be a DoD entity providing one platform for this feasibility assessment.27 Fourth, **SMR** technology **offers** the Marine Corps **a**nother **unique means to lead from the front**—not just of the other Services but also of **the Nation, and** even **the world**.28 **This** potential Pete Ellis **moment should be seized**. There are simple steps we could take, and others stand ready to lead if we are not.30 But **the temptation to “wait and see” and “let the others do it; then we’ll adopt it” mentality is not** always **best**. **Energy security demands boldness**, not timidity. To be fair, nuclear technology comes with challenges, of course, and with questions that have been kicked around for decades. An April 1990 Popular Science article asked, “Next Generation Nuclear Reactors—Dare we build them?” and included some of the same verbiage heard in similar discussions today.31 Compliance with National Environment Policy Act requirements necessitates lengthy and detailed preaction analyses, critical community support must be earned, and disposal challenges remain. Still, none of these hurdles are insurmountable. Yet despite the advances in safety, security, and efficiency in recent years, nuclear in the energy equation remains the new “n-word” for most military circles. And despite the fact that the FY10 National Defense Authorization Act called on the DoD to “conduct a study [of] the feasibility of nuclear plants on military installations,” the Office of the Secretary of Defense has yet to fund the study. Fifth**, the** **cumbersome, bureaucratic certification** **process** **of** **the** Nuclear Regulatory Commission (**NRC**), often **enough to scare away potential entrepreneurs and investors, is not** **necessarily** **a roadblock to success**. The NRC is “responsible for licensing and regulating the operation of commercial nuclear power plants in the United States.” **Military installations offer unique platforms that** could likely **bypass** an extended **certification** process. **With established expertise and a long safety record in nuclear reactor certification**, operations, training, and maintenance, the Naval Nuclear Propulsion Program comprises the civilian and military personnel who: . . . design, build, operate, maintain, and manage the nuclear-powered ships and the many facilities that support the U.S. nuclear-powered naval fleet.”34 **Bypassing the NRC and initiating SMR experimentation** under ADM Hyman Rickover’s legacy umbrella of naval reactors **could shorten the process to a reasonable level for** Marine and naval **installations**.35

**DOD key- prevents unfavorable lock-in**

**Andres and Breetz 11**

(Richard B. Andres is Professor of ¶ national Security Strategy at the ¶ national War College and a Senior fellow and energy and environmental ¶ Security and Policy Chair in the Center ¶ for Strategic research, institute for national Strategic Studies, at the national Defense University. Hanna L. Breetz is a doctoral candidate in the Department of Political Science at the Massachusetts institute of technology, “Small Nuclear Reactors ¶ for Military Installations:¶ Capabilities, Costs, and ¶ Technological Implications” Institute for National Strategic Studies, <http://www.ndu.edu/press/lib/pdf/strforum/sf-262.pdf>, SEH)

Technological Lock-in. A second risk is that if ¶ small reactors do reach the market without DOD assistance, the designs that succeed may not be optimal for ¶ DOD’s applications. Due to a variety of positive feedback and increasing returns to adoption (including demonstration effects, technological interdependence, network and learning effects, and economies of scale), the ¶ designs that are initially developed can become “locked ¶ in.”¶ 34¶ Competing designs—even if they are superior in ¶ some respects or better for certain market segments—¶ can face barriers to entry that lock them out of the market. If DOD wants to ensure that its preferred designs ¶ are not locked out, then it should take a first mover role ¶ on small reactors. ¶ It is far too early to gauge whether the private ¶ market and DOD have aligned interests in reactor designs. On one hand, Matthew Bunn and Martin Malin argue that what the world needs is cheaper, safer, ¶ more secure, and more proliferation-resistant nuclear ¶ reactors; presumably, many of the same broad qualities would be favored by DOD.¶ 35¶ There are many varied ¶ market niches that could be filled by small reactors, ¶ because there are many different applications and settings in which they can be used, and it is quite possible that some of those niches will be compatible with ¶ DOD’s interests.¶ 36¶ On the other hand, DOD may have specific needs ¶ (transportability, for instance) that would not be a high ¶ priority for any other market segment. Moreover, while ¶ DOD has unique technical and organizational capabilities that could enable it to pursue more radically innovative reactor lines, DOE has indicated that it will ¶ focus its initial small reactor deployment efforts on ¶ LWR designs.¶ 37¶ If DOD wants to ensure that its preferred reactors ¶ are developed and available in the future, it should take ¶ a leadership role now. Taking a first mover role does not ¶ necessarily mean that DOD would be “picking a winner” ¶ among small reactors, as the market will probably pursue multiple types of small reactors. Nevertheless, DOD ¶ leadership would likely have a profound effect on the industry’s timeline and trajectory.

**They have the personnel**

**Robitaille 12**

(George, Department of Army Civilian, United States Army War College, “Small Modular Reactors: The Army’s Secure Source of Energy?” 21-03-2012, Strategy Research Project)

Section 332 of the FY2010 National Defense Authorization Act (NDAA), “Extension and Expansion of Reporting Requirements Regarding Department of Defense Energy Efficiency Programs,” requires the Secretary of Defense to evaluate the cost and feasibility of a policy that would require new power generation projects established on installations to be able to provide power for military operations in the event of a commercial grid outage.28 A potential solution to meet this national security requirement, as well as the critical needs of nearby towns, is for DoD to evaluate SMRs as a possible source for safe and secure electricity. **Military facilities depend on reliable sources of energy to operate, train, and support national security missions. The power demand for most military facilities is not very high, and could easily be met by a SMR.** Table 1 provides the itemized description of the annual energy requirements in megawatt of electricity (MWe) required for the three hundred seventy four DoD installations.29 DoD History with SMRs **The concept of small reactors for electrical power generation is not new**. In fact, **the DoD built and operated small reactors for applications on land and at sea**. **The U.S. Army operated eight nuclear power plants from 1954 to 1977. Six out of the eight reactors built by the Army produced operationally useful power for an extended period, including the first nuclear reactor to be connected and provide electricity to the commercial grid**. 30 The Army program that built and operated compact nuclear reactors was ended after 1966, not because of any safety issues, but strictly as a result of funding cuts in military long range research and development programs. In essence, it was determined that the program costs could only be justified if there was a unique DoD specific requirement. At the time there were none.31 Although it has been many years since these Army reactors were operational, the independent source of energy they provided at the time is exactly what is needed again to serve as a secure source of energy today. Many of the nuclear power plant designs used by the Army were based on United States Naval reactors. Although the Army stopped developing SMRs, **the Navy as well as the private sector has continued to research, develop, and implement improved designs** to improve the safety and efficiency of these alternative energy sources. The U.S. Navy nuclear program developed twenty seven different power plant systems and almost all of them have been based on a light water reactor design.32 This design focus can be attributed to the inherent safety and the ability of this design to handle the pitch and roll climate expected on a ship at sea. **To date, the U. S Navy operated five hundred twenty six reactor cores in two hundred nineteen nuclear powered ships, accumulated the equivalent of over six thousand two hundred reactor years of operation and safely steamed one hundred forty nine million miles**. **The U.S. Navy has never experienced a reactor accident**.33 All of the modern Navy reactors are design to use fuel that is enriched to ninety three percent Uranium 235 (U235) versus the approximate three percent U235 used in commercial light water reactors. The use of highly enriched U235 in Navy vessels has two primary benefits, long core lives and small reactor cores.34 The power generation capability for naval reactors ranges from two hundred MWe (megawatts of electricity) for submarines to five hundred MWe for an aircraft carrier. A Naval reactor can expect to operate for at least ten years before refueling and the core has a fifty year operational life for a carrier or thirty to forty years for a submarine.35 As an example, the world’s first nuclear carrier, the USS Enterprise, which is still operating, celebrated fifty years of operations in 2011.36 The Navy nuclear program has set a precedent for safely harnessing the energy associated with the nuclear fission reaction. In addition, **the Navy collaborates with the private sector to build their reactors and then uses government trained personnel to serve as operators**. **Implementing the use of SMRs as a secure source of energy for our critical military facilities will leverage this knowledge and experience**.