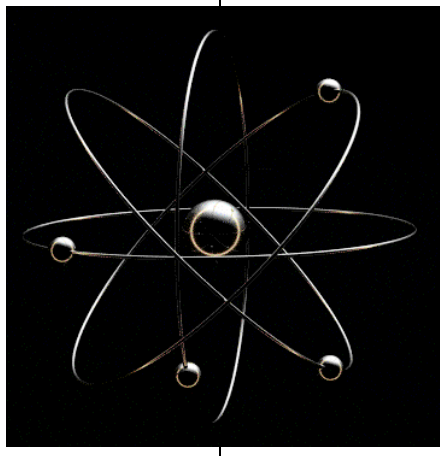
The nuclear option

BY LT. COL. GLEN BUTLER AND COL. ROBERT D. RICE

America consumes more than 20 percent of the world's oil, but has less than 2 percent of the world's oil reserves. The Defense Department spends approximately $20 billion — and the overall nation almost $1.23 trillion — on energy each year. Even before the Deepwater Horizon/BP oil disaster in the Gulf of Mexico brought energy issues to the forefront, there was no doubt that alternative forms of power production are necessary.

Even so, as U.S. armed forces parallel the business world with increasing investments and interest in all things green and "sustainable," there remains a dirty word many of our military leaders have yet to utter with serious consideration: nuclear. Long the readily dismissed yet oft-misunderstood stepchild of Three Mile Island and Chernobyl, nuclear energy today is finally undergoing the beginning of a renaissance in political and entrepreneurial circles. But even as our commander-in-chief and energy secretary deliver guidance and vision for a U.S. future that includes expanded nuclear energy, our service chiefs have yet to embrace the potential watershed opportunity. This is a mistake. Our military forces should take a hard look at the promise of modern nuclear energy technology as integral parts of their long-term plans for installations' sustainment across the homeland.



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To be fair, each service has a fairly new and comprehensive energy strategy. The Marine Corps has operated under the Department of the Navy's strategy announced in October 2009, but recently stood up an Expeditionary Energy Office (E2O) and unveiled its energy strategy at a summit in August. The Air Force has a new energy strategy; the Army's Energy Strategy for Installations and Campaign Plan was signed in 2005, but recent updates include five Strategic Energy Security Goals (ESGs) of their Energy Security and Implementation Strategy; and the Navy's Five Strategic Energy Goals include sailing a "Great Green Fleet" of "nuclear ships, surface combatants with hybrid electric power systems using biofuel, and aircraft flying only on biofuels" by 2016.

However, nuclear energy exploration is not mentioned in any of these otherwise innovative and overarching service strategies. Why?

NUCLEAR GHOSTS

One of the two main issues is likely a lingering fear of the old nuclear ghosts (harkening back to apprehension stirred by the movie The China Syndrome, and the TMI incident, of 1979), and an underlying collective misunderstanding about the capabilities and risks of modern nuclear technology. The second, more understandable hurdle likely stems from the question of funding and a fear of the unknown. With personnel, dollars and other resources already stretched thin, it is hard for many to envision the pursuit of sensitive, bold and perhaps radical concepts such as nuclear power on our military bases.

But the focus on more widely accepted "renewable" energy sources, while a step in the right direction, does not go far enough. Not only will the services be unable to achieve their ambitious goals with these more traditional renewable energy sources, but each source is burdened with its own share of prob-

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lems. The wind and sun are intermittent (the sun does not always shine; the wind does not always blow), and at best they will provide no more than 20 percent to 30 percent of our electricity, after many years. (In 2009, wind contributed only 2 percent of total generation, and solar gave us less than 0.1 percent of total U.S electrical production.) Wind farms cause conflicts with low-flying aircraft, surveillance radars and sensitive land areas, and they don't solve the storage problem. Northern Command's former commanding officer, Gen. Gene Renuart, recently voiced some of these concerns when he told the House Armed Services Committee that wind farms cause radar interference and can inhibit the defense of North America. They also often require significant new electrical distribution lines, a challenge daunting enough it famously convinced investor T. Boone Pickens to abandon his massive Texas wind farm plan last year.

Solar power causes some similar, overlapping concerns, and also suffers from vulnerability of photovoltaic and solar technology systems. Ocean Thermal Energy Conversion raises fears of restricted fishing access and dangers to sea life, and because the technology is still fairly new, wave power can cost as much as five or six times as wind power.

To be sure, most every other form of emerging, renewable energy suffers some degree of restrictions and has challenges — including potential conflict with local utility providers and unassured grid interface. Given all of these issues, the likelihood of actually achieving our ambitious energy goals without additional generation sources and technology is questionable.

Beyond these limitations and the obvious "doing the right thing" aspect of traditional renewable energy, another reason — the key reason — for the military to consider nuclear energy on our installations is to strengthen national security. President Obama, former National Security adviser James Jones and other political and military leaders have said energy security *is* national security. If this is true, then our bases and stations — so largely reliant on external power sources — are at risk, and there is much work to be accomplished.

The elephant in today's energy room is the fact that many military communities rely disproportionately on foreign oil for energy. Hawaii is a prime example, a state strategically located in the middle of the Pacific (and where the military passed tourism last year as the No. 1 economic source), yet a state with the highest dependence in the nation on fossil fuels — approximately 90 percent, mostly from Indonesian oil.

To achieve the kind of energy independence — and thus security — our leaders are calling for requires much more than compact fluorescent light bulbs, photovoltaic panels, biofuel plants and wind farms. Nuclear energy is a promising, yet rarely mentioned, option.

Of course, the U.S. is not the only country striving for energy advancements. China, India, Brazil, Japan, South Korea, France and many other nations, including our adversaries, are ambitiously moving forward with renewable — and yes, nuclear — power production. France generates almost 80 percent of its power from nuclear energy. Some sources indicate that the nuclear energy sector is likely to grow to a trillion-dollar market by 2030.

This means there will be growing international competition to provide this energy source. American entrepreneurs understand the nature of this competition, too. Bill Gates identified nuclear power as one attractive avenue while discussing energy and climate issues. He specifically mentioned new technology he was investing in — developing nuclear technology that ran on its own waste. However, recognizing the lack of apparent interest and expertise in the U.S., he acknowledged that he's been looking to Russia, India and China for ideas.

SMALL MODULAR REACTORS

While fears of nuclear energy remain, some forward thinkers are pressing on and helping emerging technology to gain momentum. Small Modular Reactors (SMRs) are being developed by several companies and offer attractive energy options for military installations. These reactors are defined by the Department of Energy (DoE) as "nuclear power plants that are smaller in size [300 megawatts or less] than current generation base load plants [1,000 megawatts or higher]. These smaller, compact designs are factory-fabricated reactors that can be transported by truck or rail to a nuclear power site … 'modular' ... refers to a single reactor that can be grouped with other modules to form a larger nuclear power plant ... [they] require limited on-site preparation ... [and will be] 'plug and play.'"

Although acquiring SMRs might remain fiscally prohibitive for individual bases, there are ways to make this option feasible. U.S. Rep. Jim Marshall inserted text into the fiscal 2010 National Defense Authorization Act that directed the defense secretary to "conduct a study to assess the feasibility of developing nuclear power plants on military installations ... summarize options available to the Department to enter into public-private partnerships or other transactions for the construction and operation of the nuclear power plants; estimate the potential cost per kilowatt-hour and life-cycle cost savings to the Department; consider the potential energy security advantages of generating electricity on military installations through the use of nuclear power plants."

LOU HERNANDEZ/AIR FORCE

Workers install solar panels at Los Angeles Air Force Base, Calif.

In October 2009, the president signed a provision to facilitate a study on the development of nuclear power plants for military installations. Despite a less-than-enthusiastic reception of this provision by the Pentagon, sources indicate the study is ongoing but will not be completed until later this year.

Energy Secretary Steven Chu, meanwhile, has proven to be a nuclear energy champion. He has emphatically advocated SMRs, and penned a Wall Street Journal op-ed ("America's New Nuclear Option," March 23, 2010), which highlighted the potential significant advantages of SMR technology. Chu called SMRs "one of the most promising areas" in new energy technologies, and said "most importantly, investing in nuclear energy will position America to lead in a growing industry. ... Our choice is clear: develop these technologies today or import them tomorrow."

In the fiscal 2010 budget, no funds were allocated to the U.S. SMR program, but $38.9 million has been allocated for fiscal 2011. This is to support two primary activities: public/private partnerships to advance SMR designs, and for research and development and demonstrations. According to the DoE's website, one of the planned program accomplishments for fiscal 2011 is to "collaborate with the Department of Defense ... to assess the feasibility of SMR designs for energy resources at DoD installations."

HOW TO PROCEED

So how should the military begin exploring the advantages of SMRs on their installations?

First, a multiservice nuclear energy working group should be formed, perhaps similar in spirit to the Global Nuclear Energy Partnership. This joint group should include knowledgeable and empowered individuals from each branch of the service interested in exploring nuclear energy possibilities, and would develop a plan of action and milestones for required resources and the way ahead for this endeavor.

The Air Force has installations and experts dedicated to far-reaching, advanced technology such as space research, quantum physics, nuclear fission and even the holy energy grail of nuclear fusion. With places like Albuquerque's Sandia National Laboratories, and an energy strategy vision catchphrase "make energy a consideration in all we do" as one of its centerpieces, this technologically savvy service might make a good partner with which to cross into SMR exploration.

NUCLEAR *continued on Page 37*

FUELING *continued from Page 15*

must be sensitive to DoD's energy goals. The private sector and academia must be cognizant of DoD's unique energy needs — especially technical specifications for liquid fuels and the global nature of its operations — as they develop new energy technologies for the broader economy.

Transitioning away from petroleum dependence by 2040 will be difficult, but fortunately the U.S. defense sector has successfully made several energy transitions in its history, in particular in moving from coal to petroleum to nuclear power in its ships. In a similarly seismic shift, DoD rapidly increased its reliance on electronics, space assets and computer systems in modern warfare in ways that enhanced mission effectiveness. These experiences may offer lessons for DoD leveraging an energy transition to maximize its strategic flexibility and freedom of maneuver.

Making this transition will take decades. And it raises the question: What will a post-petroleum future look like for DoD?

If it begins now, it will be a future of greater energy supply security than DoD faces today. It will require efficiency gains and adoption of renewable drop-in fuels, or liquid fuels that are chemically equivalent to petroleum-based fuels and can therefore fuel existing platforms. A future of more diverse fuel supplies could bring benefits beyond just assuring sufficient supplies: If DoD can procure fuels from a portfolio of sources, such as fuels made from locally grown switchgrasses, algae, camelina or other crops, that diversity can help to keep prices competitive (especially as a hedge against weather or economic conditions reducing crop output in any given region) and deny suppliers leverage over the U.S. Making this transition could help DoD's bottom line as well.

Moving beyond petroleum will allow DoD to lead in the development of innovative technology that can benefit the nation more broadly. It will signal to the world that the U.S. military is an innovative and adaptable force. Above all, reducing dependence on petroleum will help ensure the long-term ability of the military to carry out its assigned missions — and help ensure the security of the nation. **AFJ**

NUCLEAR *continued from Page 19*

The Marines pride themselves on innovation and "out-of-the-box" approaches, and with their naval partners including many experts in the nuclear propulsion and power fields, offer not only enthusiasm but expertise and possibly even administrative acceleration, if plant certifications can be achieved through the Naval Nuclear Propulsion Program (NNPP; "Naval Reactors") and not the Nuclear Regulatory Commission. The NRC is responsible for "licensing and regulating the operation of commercial nuclear power plants in the United States." Military installations, however, offer unique platforms that could very possibly bypass an extended certification process. This option should be explored.

With established expertise and a long safety record in nuclear reactor certification, operations, training and maintenance, "Naval Reactors" 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." The program responsibilities are specified in Executive Order 12344 (1 Feb. 1, 1982) and Public Laws 98-525 (Oct. 19, 1984) and 106-65 (Oct. 5, 1999). E.O. 12344 explains that the NNPP is an "integrated program carried out by two organizational units, one in the Department of Energy (DOE) and the other in the Department of the Navy." So, Naval Reactors should adopt an additional mission: coordinating with the Joint Nuclear Energy Working Group to research and pursue SMR technology on military installations.

Finally, partnerships and Enhanced Use Leases (EULs) to support SMR deployments should be explored. As the overall expertise in SMR technology grows, additional capabilities such as expeditionary and vehicular power sources should be explored. Other technologies — including hybrid/electric vehicle power storage and recharging facilities, and water desalination plants — could possibly even co-locate with nuclear plants on installations to co-use the energy. Many external challenges do exist; compliance with the National Environmental Policy Act (NEPA) of 1969 takes time, and community support would be a critical piece of this undertaking — but neither are impediments to success if planning and execution are conducted smartly.

The idea of putting nuclear power plants on military installations is by no means new, yet the time has never been better and the technology never as promising as now. The president and Chu continue to voice support for new nuclear energy initiatives, and a large, bipartisan group of political leaders stands poised to back such a plan. This inviting climate is the open door and momentum the DoD should capitalize on by aggressively pursuing what could truly be the next Apollo pProgram. If we fail to explore this promising frontier, we are likely to lose this modern energy "space race" to the Chinese and other eager competitors. That is something the U.S. cannot afford to do.

Look no further for guidance than the current National Military Strategy, released in May, in which the commander in chief declares: *The United States has a window of opportunity to lead in the development of clean energy technology. If successful, the United States will lead in this new Industrial Revolution in clean energy that will be a major contributor to prosperity ... We must continue to transform our energy economy ... increase use of renewable and nuclear power. ... We will invest in research and next-generation technology. ... Our effort begins with the steps we are taking at home. We will stimulate our energy economy at home, reinvigorate the U.S. domestic nuclear industry ... and provide incentives that make clean energy the profitable kind of energy.*

The military, with its self-sufficient mini-communities across the country, offers perfect beta-test platforms and has the requisite expertise and pioneering spirit to take the nuclear energy helm. Beyond the economic value cited above by the president, putting nuclear SMRs on military installations would greatly improve our energy security — which, in turn, would strengthen our national security. After all, energy security *is* national security.

The time for the long-anticipated nuclear renaissance is now … and the military should enthusiastically seize the opportunity to lead the way. **AFJ**