Statement of Deputy Under Secretary of Defense for Installations and Environment

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Thank you for the opportunity to testify on the Department of Defense's strategy for improving energy management at our military installations. As the Deputy Under Secretary of Defense for Installations and Environment, I oversee policy and programs related to energy use on the 500-plus permanent installations we maintain at home and overseas. In that capacity, I work closely with my counterparts in the Military Departments, who are here today. I also work closely with the (acting) Director for Operational Energy Plans and Programs in the Office of the Secretary of Defense.

The recently released Quadrennial Defense Review (QDR) makes clear that crafting a strategic approach to energy and climate change is a high priority for the Department of Defense (DoD). This reflects mission considerations above all. The Department's own analysis confirms what outside experts have long warned: our military's heavy reliance on fossil fuels creates significant risks and costs at a tactical as well as a strategic level. They can be measured in lost dollars, in reduced mission effectiveness and in U.S. soldiers' lives. Unleashing warfighters from the tether of fuel and reducing our installations' dependence on a costly and potentially fragile power grid will not simply enhance the environment, it will significantly improve our mission effectiveness.

The Department's permanent installations comprise hundreds of thousands of buildings and facilities, and the Department spends several billion dollars a year on the energy required to operate them. Over the last five years, the Department has steadily reduced energy consumption per square foot at these installations, largely in response to statutory and regulatory goals. While continuing that very positive trend, it is time for us to adapt our approach to installation energy management from one that is primarily focused on compliance to one that is focused on long-term cost avoidance and mission assurance.

In my testimony today, I will talk about why installation energy management matters and what we are doing to improve it. I will discuss the importance of the two goals noted above (long-term cost avoidance and mission assurance) and identify some of the impediments we face in trying to achieve them. I will also review the Department's performance on key statutory and regulatory goals related to energy efficiency. Finally, I will describe the major elements of the Department's strategy for building on that record to further reduce energy costs and improve energy security.

Why Installation Energy Management Matters

The Department of Defense consumes energy for two broad purposes. The first is to support our combat, or operational, forces. "Operational energy" consists largely of the fuel used by aircraft, ships, tanks, trucks and other tactical vehicles, as well as by the generators that provide heating, air conditioning and other forms of power at our forward operating bases in Afghanistan and Iraq.

The second broad use of energy is to support the 507 fixed installations we operate in the United States and overseas. These installations comprise more than 300,000 buildings, which contain 2.2 billion square feet of space—a footprint four times that of Walmart and ten times that of the U.S. General Services Administration. Moreover (and in contrast to Walmart, with its uniform, big-box structures), the Department's inventory of buildings is diverse, encompassing barracks, commissaries, data centers, office buildings, laboratories, and aircraft maintenance depots. "Facilities energy" consists largely of traditional energy sources used to heat, cool, and provide electrical power to these buildings. It also includes the fuel used by the 160,000 non-tactical vehicles housed at our installations.

The management of energy on our installations is important for two key reasons. One, facilities energy represents a significant cost. In 2009, DoD spent $3.8 billion to power its facilities—down from $3.96 billion in 2008. That represents about 28 percent of the Department's total energy costs (that fraction is higher in peacetime, when we are not consuming large amounts of operational energy). Moreover, energy needs for fixed installations in the United States will likely increase over the next several years as we "grow" the Army and the Marine Corps, reduce our presence in Iraq and Afghanistan, and continue to improve the quality of life for soldiers and their families—for example, by installing flat-panel TVs in individual rooms in a barracks that now has just one TV per common room.

Facilities energy is costly in other ways as well. Although fixed installations and non-tactical vehicles account for less than a third of DoD's energy costs, they contribute nearly 40 percent of our greenhouse gas emissions. This reflects the fact that our installations rely on commercial electricity, which comes from fossil fuels—principally coal. Given that facilities energy as a share of total DoD energy will increase when we reduce our presence in Iraq and Afghanistan, fixed installations will likely become DoD's major source of greenhouse gas emissions.

Two, installation energy management is key to mission assurance. According to the Defense Science Board, DoD's reliance on a fragile commercial grid to deliver electricity to its installations places the continuity of critical missions at serious and growing risk.[1] Most installations lack the ability to manage their demand for and supply of electrical power and are thus vulnerable to intermittent and/or prolonged power disruption due to natural disasters, cyberattacks and sheer overload of the grid.

[1] "More Fight-Less Fuel," Report of the Defense Science Board Task Force on DoD Energy Strategy, February 2008.

The changing role of the military's installations accentuates this concern. Although in the past fixed installations functioned largely to train and deploy our combat forces, they have an increasingly direct link to combat operations, by providing "reachback" support for those operations. For example, we operate Predator drones in Afghanistan from a facility in Nevada and analyze battlefield intelligence at data centers in the United States. Our installations are also becoming more important as a staging platform for homeland defense missions. This means that power failure at a military base here at home could threaten our operations abroad or harm our homeland defense capability.

Impediments to Doing More, Better

There are a number of impediments to improving the way we manage energy on our installations along the dimensions discussed above. Without attempting to offer an exhaustive list, let me mention two related impediments: flawed incentives and lack of information.

In its recent report on DoD energy strategy, the Defense Science Board identified several ways in which flawed incentives impede investment in energy efficiency.[2] One is the oft-cited problem of "split incentives," which arises because energy efficiency requires increased capital investment but yields savings over time in reduced operations and maintenance. That leads to under-investment in energy efficiency within DoD, because often the individual or entity responsible for capital spending is different from the one responsible for operations and maintenance. A related problem noted by the Board is that a commander who succeeds in reducing energy consumption is not able to keep the savings—in fact, his or her budget typically gets reduced. Although the Military Departments have developed mechanisms to offset this disincentive, they are limited in scope. A different type of incentive problem is reflected in the vulnerability of our installations to disruption of the power grid. According to the Defense Science Board, although certain improvements in the energy efficiency of installations would have national security value far greater than the economic value of reduced electricity consumption, the business case for these improvements ignores the benefit to national security.

Lack of information is another impediment to improved installation energy management. The Department currently lacks an enterprise-wide energy information management system that can provide the appropriate information on energy consumption at various levels of aggregation, including the individual building, the installation, the geographic region and the Military Department. This hampers DoD's ability to monitor, measure, manage and maintain energy systems at their optimal performance levels; collect renewable energy generation and performance data; and compare performance across facilities and across Military Departments.

These two problems are linked. Without an energy information management system in place, it is difficult to implement an efficient approach to utility charges. Under such an approach, individual users confront the cost of their usage, ideally in real time, and thus have an incentive to reduce their overall use or shift activity to off-peak periods. This type of charging system, which has been shown to elicit a significant "demand response" from users, will be key to improved installation energy management.

[2] "More Fight-Less Fuel," Report of the Defense Science Board Task Force on DoD Energy Strategy, February 2008.

Installation Energy Goals and Performance

Despite these impediments, the Department of Defense has noticeably improved the energy performance of its fixed installations over the last five years, largely in response to statutory and regulatory goals. Although we are not meeting all of the targets, that is primarily a reflection of operational demands.

The key statutory and regulatory goals relevant to installation energy consumption require the following:

- Reduce energy intensity (BTUs per square foot) by 3 percent per year, or 30 percent overall, by 2015 from the 2003 baseline [Energy Independence and Security of 2007]. Under DoD's High Priority Performance Goals, the interim target is an 18 percent reduction by the end of 2011.
- Increase use of renewable energy to 7.5 percent in 2013 and beyond [Energy Policy Act of 2005, or EPACT]; and produce or procure 25 percent of all electric energy from renewable sources by the end of 2025 [National Defense Authorization Act of 2007, or NDAA]. Under DoD's High Priority Performance Goals, the interim NDAA target is 14.3 percent by 2011.
- Reduce consumption of petroleum (gasoline and diesel) by non-tactical vehicles by 30 percent by 2020 [Executive Order 13514, October 2009].

With respect to energy intensity, we have made solid progress but fallen short of the goal: DoD reduced its energy intensity by 10 percent from 2005 to 2009, compared to the goal of 12 percent. From 2005 to 2008, we reduced the energy intensity of our facilities by 11 percent relative to the baseline (2003). However, in 2009, our energy intensity actually went up slightly, by 1.1 percent. This largely reflects the demands on the Army related both to the movement of troops and equipment to and from Afghanistan and Iraq and to the completion of the Base Realignment and Closure process (as it closes some facilities and moves to others, the Army is carrying out certain functions temporarily at multiple locations).

By contrast, we exceeded the EPACT goal for increased consumption of renewable energy: DoD achieved 3.6 percent, compared to the 2009 EPACT target of 3.0 percent. That said, the 2025 goal (produce or procure 25 percent from renewable sources)—a goal that applies only to DoD—remains a major challenge, and we are not even close to meeting the interim target.

With respect to consumption of petroleum by non-tactical vehicles, the Department also exceeded the target: DoD achieved a 9 percent reduction in its petroleum use from the 2005 baseline, compared to the target of 8 percent.

The Department's Strategy for Improving Installation Energy Management

In the last year, the Department has made energy policy a significantly higher priority, partly in response to the growing recognition that operational energy has a long logistics "tail," which

imposes large risks and hidden costs. Let me describe the key elements of this stepped-up strategy on energy, with an emphasis on facilities energy.

Senior Leadership and Organization

The first element is senior leadership—commitment from the top—and corresponding organizational changes. Secretary Gates has expressed his strong support for the goal of reducing energy consumption, and the QDR reflects his desire for a more strategic approach to energy security. Among other things, he has created the office of Director for Operational Energy Plans and Programs. The President has nominated Sharon Burke to head this new Directorate, and we hope the Senate will confirm her very soon.

The Military Departments are staffing up their energy offices as well and they are developing detailed strategic plans and metrics. Without exception, the Service Secretaries have made energy a high priority. For example, in October, Navy Secretary Ray Mabus announced a set of ambitious new goals to boost the energy efficiency of the Navy and the Marine Corps. With respect to installations, he directed that the Department of the Navy get 50 percent of its shore energy from alternative sources by 2020 and reduce by half the amount of petroleum consumed by fleet vehicles by 2015.

The Department as a whole recently announced that, under Executive Order (EO) 13514, it will reduce greenhouse gas emissions from non-combat activities—largely installations and non-tactical vehicles—by 34 percent by 2020. Since greenhouse gas pollution is due overwhelmingly to direct energy use, this aggressive target will require major gains in energy efficiency at our installations. Operational energy is necessarily exempt from this target, since providing immediate support for the warfighter must remain our highest priority. Nevertheless, reducing the energy demands of our operational forces is a major focus of the Department's efforts to cut energy consumption. Moreover, our combat operations will benefit as we improve the energy profile at our supporting installations and solve the cross-cutting structural problems that drive DoD's energy inefficiency.

Increased Investment

Second, the Department is investing more to improve the energy profile of our fixed installations. Financing for these investments has come from annually appropriated funds, including military construction, operations and maintenance, and the Energy Conservation Investment Program (ECIP). (Below I discuss the investments we made with one-time appropriations from the American Recovery and Reinvestment Act.) We have utilized third-party financing through Energy Savings Performance Contracts (ESPCs) and Utilities Energy Service Contracts (UESCs). We are also pursuing other innovative financing mechanisms, such as Enhanced Use Leases (EULs) and Power Purchase Agreements (PPAs).

Our basic investment strategy is twofold: 1) reduce the demand for traditional energy through conservation and energy efficiency; and 2) increase the supply of renewable and other alternative energy sources. Investments that curb demand are the most cost-effective way to improve an installation's energy profile. As Department of Energy (DOE) Secretary Steven Chu has observed, "Energy efficiency is not just the low hanging fruit; it's the fruit lying on the ground."

A large fraction of our demand-side (energy efficiency) investments go to retrofit existing buildings. The Department spends almost $10 billion a year to sustain, restore and modernize our facilities. About one-sixth ($1.7 billion) of this is spent on projects designed directly to improve energy efficiency. Typical projects install improved lighting, high efficiency HVAC systems, double-pane windows, energy management control systems and new roofs. As we replace major components and subsystems in our buildings, the newer, more energy efficient systems contribute to DoD's overall energy reduction goals.

In addition to retrofitting existing buildings, we are taking advantage of new construction to incorporate more energy efficient designs, material and equipment into our inventory of facilities. The Department spent about $25 billion on military construction in FY2009 and we will devote another $23 billion to construction in FY2010. New construction must meet LEED Silver standards and/or the five principles of High Performance Sustainable Buildings (these principles are included in EO 13423 and referenced in EO 13514). It must also be 30 percent above the energy efficiency standard set by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

Investment designed to expand the supply of renewable energy sources on base is also important. Although the payback period is significantly longer than that for energy efficiency projects, renewable energy is key to energy security. When combined with microgrid technology and energy efficiency investments that significantly reduce demand, distributed renewable energy sources will allow installations to carry out mission-critical activities and potentially serve as mini-islands that can support restoration of the grid in the event of disruption.

Military installations—which are large and disproportionately located in the Southwest and on our coasts—are well-situated to support solar, wind, geothermal and other forms of renewable energy. For example, Nellis Air Force Base in southern Nevada built a 14-megawatt (MW) photovoltaic solar array: more than 72,000 solar panels track the sun to generate 30 million kilowatt-hours of electricity per year—equivalent to a quarter of the total power used at the 12,000-person base. As with most renewable energy projects on military installations, Nellis took advantage of third-party financing. Nellis saves $1 million a year in electricity costs and avoids 24,000 tons of carbon dioxide emissions.

The military's interest in renewable energy is nothing new. Naval Air Weapons Center China Lake in California has been operating a 270-MW geothermal plant since 1987. The heat from 166 wells, some of them 12,000 feet deep, is sufficient to light up 180,000 homes. The Navy is helping the Army tap into geothermal resources at its Weapons Depot in Hawthorne, Nevada, and that project will be capable of producing 30 MW of clean power.

Finally, let me note that the Department took advantage of the $7.4 billion it received through the Recovery Act to invest in both energy efficiency and renewable energy projects. We devoted $2 billion of that amount to projects designed to improve existing buildings, largely through upgraded systems and equipment. Of that, $90 million went to ECIP, which supports energy efficiency and renewable projects based on payback and which has achieved an estimated $2.16 in savings for every dollar spent. Another $1.6 billion of Recovery Act funds is going to construct new facilities, all of which will meet LEED Silver standards and/or the five guiding principles of High Performance Sustainable Buildings.

RDT&E: Installations as a Testbed for Next-Generation Energy Technology

The military has a long history of stimulating new technology, beginning with the War Department's support for the development of interchangeable machine-made parts for musket production in the 1800s. Although DoD has provided this support solely for national security reasons, the technologies spawned have served as key drivers for U.S. economic growth and competitiveness. The commercial success of these technologies, ranging from aerospace to the internet, has in turn benefited DoD by allowing the military to take advantage of the cost savings and further technology advances from the private sector.

With respect to facilities energy, the military's most valuable role will be as a testbed for next-generation technologies coming out of laboratories in industry, universities and the Department of Energy. As I noted earlier, DoD's built infrastructure is unique for its size and variety, which captures the diversity of building types and climates in the United States. For a wide range of energy technologies for which deployment decisions must be made at the local level, DoD can play a crucial role by filling the gap (the "valley of death") between research and deployment.

As both a real and a virtual testbed, our facilities can serve two key roles in which the military has historically excelled. One is as a sophisticated first user, evaluating the technical validity, cost and environmental impact of advanced, pre-commercial technologies. For technologies that prove effective, DoD can go on to serve as an early customer, thereby helping create a market, as it did with aircraft, electronics and the internet. This will allow the military to leverage both the cost savings and technology advances that private sector involvement will yield.

We are pursuing the energy testbed approach on a small scale through the Environmental Security Technology Certification Program (ESTCP). Using $20 million in Recovery Act funding, ESTCP awarded contracts through a competitive solicitation to 9 projects to demonstrate technologies that will provide for increased energy efficiency or that will generate cost effective renewable power on site.

To illustrate, consider that buildings degrade over time in terms of their energy performance, rarely meeting their design intent much less performing optimally. Advances in monitoring and modeling tools allow us to continuously commission and optimize building performance. Two ESTCP projects are demonstrating a whole-building monitoring system and will assess its ability to: 1) identify, classify and quantify deviations from design intent or optimal performance in terms of the consumption of building energy and water; 2) classify and identify the root causes of such deviation; 3) identify corrective actions; and 4) quantify the value of these actions in terms of energy and water savings and other economic benefits. Project participants include United Technologies Research Center, Lawrence Berkeley National Laboratory, the University of California at Berkeley and Oak Ridge National Laboratory. There are three demonstration sites for the projects: Naval Base Ventura, California; the Army's Construction Engineering Research Laboratory in Champaign, Illinois; and Great Lakes Naval Station in Illinois.

Another ESTCP project builds on the recognition that facilities are more sustainable if renewable energy systems can be cost effectively integrated into their initial design. ESTCP is conducting a multi-site demonstration of building-integrated photovoltaic (BIPV) roof concepts. By verifying that an energy efficient roof can perform its expected function, DoD can increase its capacity to

generate renewable energy. The Naval Facilities Command leads this project in collaboration with Lawrence Berkeley National Laboratory. Demonstrations are taking place at Luke Air Force Base and Marine Corps Air Station Yuma, both in Arizona, and Naval Air Station Patuxent River in Maryland.

The testbed approach is key to meeting the Department's needs, but it is also an essential element of a national strategy to develop and deploy the next generation of energy technologies needed to support our built infrastructure. We hope to expand it, working closely with the Department of Energy and other agencies and organizations.

Other Key Initiatives

The Department is pursuing several other initiatives to address specific challenges or impediments to improved installation energy management. Let me briefly describe two of them.

First, we are addressing DoD's lack of an enterprise-wide energy information management system for its global assets. Large commercial enterprises manage their energy portfolio using such data systems; they are essential to a firm's ability to set goals and incentives for optimal energy efficiency and to monitor subsequent performance. My office has begun to evaluate various commercial systems and assess DoD's needs with the goal of having the Department develop and implement a state-of-the-art, mission-driven, *enterprise-wide energy information management system* that can provide the appropriate information on energy consumption at various levels of aggregation, including the individual building, the installation, the geographic region and the Military Department. With accurate management, control, collection and analysis of energy data, DoD can more effectively monitor, measure, manage and maintain energy systems at their optimal performance levels; collect renewable energy generation and performance data; and compare performance across facilities and across Military Departments.

Second, we have begun what will likely be a major effort to *address the risk to our installations from potential disruptions to the commercial electric grid*. The Department is participating in interagency discussions on the magnitude of the threat to the grid and how best to mitigate it. We are also looking at how to ensure that we have the energy needed to maintain critical operations in the face of a disruption to the grid. As required by the National Defense Authorization Act, the Secretary of Defense this year will give Congress a plan for identifying and addressing areas in which electricity needed for carrying out critical military missions on DoD installations is vulnerable to disruption. The development of renewable and alternative energy sources on base will be one element of this effort, because—in combination with other investments—these energy sources can help installations to carry out mission-critical activities and support restoration of the grid in the event of disruption.

As discussed earlier, the Defense Science Board concluded that, because of the vulnerability of the grid, rapid improvements in the electrical efficiency of military installations would have national security value far greater than the economic value of reduced electricity consumption. The Board argued that the risks and consequences of grid outage should be the basis for a business case to pursue higher levels of energy efficiency at permanent installations. Our planned assessment of the risk facing individual critical missions and installations will allow us to evaluate that business case.

Third, we are devoting considerable time and effort to a complex and growing challenge—*ensuring that proposals for domestic energy projects, including renewable energy projects, are compatible with military requirements for land and airspace*. As noted above, military installations lend themselves to renewable energy development, and a renewable project can benefit the host installation by providing a secure source of energy and reduced energy costs. In some cases, however, a proposed project can interfere with the military mission. For example, wind turbines can degrade air- and ground-based radar, and solar towers can cause interference by creating thermal images detrimental to sensitive testing of weapons systems. The current process for reviewing proposals and handling disputes is opaque, time consuming and ad hoc.

The Department is working to balance the nation's need for renewable sources of energy with military mission needs. The DoD "product team" devoted to sustaining our test and training ranges, which I co-chair, is working to come up with a better process for evaluating proposals from energy developers who want to site a renewable project on or near an installation. We have begun to reach out to potential partners, including other federal agencies, energy developers, state and local governments, and environmental organizations. In addition to working to improve the current approval process, the Department is looking at the role of research and development. New technology can allow us to better measure the potential impact of a proposed project. It can also help to mitigate the impact. For example, recent press accounts suggest that developments in stealth technology as applied to turbine blades can reduce the harm to ground-based (but not air-based) radar.

Conclusion

The management of installation energy is an important issue. Facilities energy represents a significant cost to the Department. Moreover, it is increasingly important to ensure that mission-critical activities have reliable access to energy. The Department has steadily improved the energy profile at its installations in recent years, largely in response to statutory and regulatory goals. While continuing that very positive trend, it is time for us to adapt our approach to installation energy management from one that is primarily focused on compliance to one focused on long-term cost avoidance and mission assurance.

The Department has made energy policy a priority, and we are investing more both to reduce demand and to expand the supply of renewable energy. We will also need to leverage the Department's strength in research and development, particularly by using our installations as a real and virtual testbed for next-generation building energy technologies. Finally, we will need to address the impediments to improved installation energy management, including flawed economic incentives. We look forward to working with the Congress to address the challenges and opportunities we face in this exciting and important area.