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**Statement of**

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Chairman Forbes, Representative Bordallo and distinguished Members of the Subcommittee: Thank you for the opportunity to testify on what the Department of Defense is doing to promote energy security. The bulk of my testimony is devoted to a discussion of the Department's facility energy strategy, which is designed to reduce the costs and improve the security of the energy used on our fixed installations. In addition, I summarize the Department's performance with respect to the major statutory and regulatory goals related to energy and water. Finally, I describe the Department's efforts to ensure that the siting of transmission and renewable energy projects on and around DoD facilities is compatible with mission activities.

## I. DoD's Facility Energy Strategy

Facility energy is important to the Department of Defense for two reasons.[1] The first is cost. With more than 300,000 buildings and 2.2 billion square feet of building space, DoD has a footprint three times that of Walmart and six times that of the General Services Administration. Our corresponding energy bill is $4 billion annually—roughly 10 percent of what DoD spends to operate and maintain its installation infrastructure. There are non-monetary costs as well: although facility energy represents only 20-25 percent of DoD's energy costs, it accounts for nearly 40 percent of our greenhouse gas emissions.

Second, facilities energy is critical to mission assurance. Our fixed installations support combat operations more directly than ever before, and they serve as staging platforms for humanitarian and homeland defense missions. These installations are largely dependent on a commercial power grid that is vulnerable to disruption due to aging infrastructure, weather-related events and a potential kinetic or cyber attack. The Defense Science Board has warned that DoD's reliance on a fragile power grid to deliver electricity to its bases places critical missions at risk.[2]

The Department's facility energy strategy, designed to reduce the energy costs and improve the energy security of our fixed installations, has four inter-related elements:

- Reduce the demand for traditional energy through conservation and energy efficiency;
- Expand the supply of renewable energy and other forms of distributed (on-site) energy;
- Enhance the energy security of our installations directly (as well as indirectly, through the first two elements); and
- Leverage advanced technology.

Below I discuss our actions in each area. I pay particular attention to the last one. Although clean energy is a new focus for DoD, the U.S. military has a long history of developing, demonstrating and acquiring new technology to achieve mission goals. Technological innovation has been the military's comparative advantage when it comes to combat operations for more than 200 years, and it should be central to our facility energy strategy as well.

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[1] Facility energy refers to the energy (largely electricity) used to operate the buildings on the Department's 500+ fixed military installations in the United States and overseas. It also includes the fuel used by DoD's 200,000 non-tactical vehicles. Facility energy is distinct from operational energy—largely fuel used for mobility (military aircraft, ships and tanks) and by the generators that produce power on our forward operating bases.

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

### A. Reduce Demand

First and most important, the Department is reducing its demand for traditional forms of facility energy through conservation and improved energy efficiency. We share Energy Secretary Chu's view that "Energy efficiency is not just the low-hanging fruit—it's the fruit laying on the ground." The Department's FY13 budget includes more than $1.1 billion for investments in conservation and energy efficiency, and almost all of that is directed to existing buildings. The lion's share ($968 million) is in the Military Components' operations and maintenance accounts, to be used for sustainment and recapitalization projects. Such projects typically involve retrofits to incorporate improved lighting, high-efficiency HVAC systems, double-pane windows, energy management control systems and new roofs.

The remainder ($150 million) is for the Energy Conservation Investment Program (ECIP), a flexible military construction account that my office allocates to the Services for specific projects.[3] ECIP traditionally funded small projects that promised a significant payback in reduced energy costs, and the Services relied on it to achieve their energy goals. In keeping with DoD's increased focus on energy, last year we began to reshape the role that ECIP plays—from one of funding the Services' routine energy projects to one of leveraging their now-larger investments in ways that will produce game-changing improvements in energy consumption, costs and/or security.

Two other changes in ECIP are worth noting. First, to encourage long-term planning, my office is requiring the Services to identify the set of projects that they want ECIP to fund over the next five years. Second, to encourage them to put forward their best ideas, we are replacing formula-funding with inter-Service competition. In FY13, we incorporated some competition but still guaranteed each Service a minimum level of funding. Beginning in FY14, we will award the funds based purely on competitive merit.

In addition to direct funding (their own and that provided by ECIP), the Services are using performance based contracts to improve the energy efficiency of existing buildings. In response to the President's memo calling on the federal government to initiate $2 billion worth of these performance-based contracts over the next two years, the Department has established its own goal to meet at least half of that commitment. Moreover, the Army has kicked off three ESPC projects that incorporate the development of solar energy to be used by the installation. (See the discussion below on our desire to have ESPCs incorporate more advanced technology.)

In addition to retrofitting existing buildings, the Department is taking advantage of new construction to incorporate more energy-efficient designs, material and equipment into our inventory—with the goal of producing new buildings that are less expensive to own and operate, improve employee productivity and leave a smaller environmental footprint. Currently, all new construction must meet the LEED (Leadership in Energy and Environmental Design) Silver (or an equivalent) standard and/or comply with the five principles of High Performance Sustainable

[3] Roughly three-quarters of ECIP's FY13 budget will go for investments in energy efficiency and water conservation; the rest will go for investments in renewable or other on-site sources of energy.

Buildings. It also must exceed the energy efficiency standard set by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) by at least 30 percent.

My office is developing a new code for the construction of high-performance, sustainable buildings which we will issue later this year. Based to some extent on ASHRAE 189.1, it will govern all new construction and major renovations as well as contracts for leased space. The goal is to improve building energy performance cost-effectively by prescribing the most attractive features of existing commercial codes and by requiring that the building be designed so as to reduce life-cycle costs. To assist us in developing this code, we have asked the National Research Council (NRC) to evaluate the major third-party "green building" rating systems and standards. In addition, the NRC is looking at alternative ways to incorporate analysis of life-cycle costs and return on investment into capital investment decisions.

As DoD strives to improve its energy efficiency, accurate, real-time facility energy information is becoming essential. The Department does a poor job of measuring its energy consumption. A large fraction of our buildings are not metered, and we lack the standardized processes and integrated systems needed to systematically track, analyze and benchmark our facility energy and water use and the related costs. The absence of usage and cost data reduces the efficiency of our existing facility operations, and it limits our ability to make the right investments in new, efficiency-enhancing technology and tools.

This Spring I will issue an updated policy on the metering of DoD facilities. In addition to lowering the threshold for buildings that must be metered, the policy will address the types of meters that can be used and establish guidelines for determining when advanced meters make financial sense. No less important, the policy will help ensure that installed meters can securely deliver data to the energy professionals in the field. As an example, Naval District Washington has developed an innovative approach that uses a secure network to integrate data on energy usage with information on building management so as to allow for active management of facility energy. We want to see this approach or one like it deployed throughout the Department.

In addition, my office has been leading the development of an Enterprise Energy Information Management (EEIM) system that will facilitate the automated collection of standardized facility energy and cost data. Automation will reduce the time it now takes for energy managers to input and analyze data manually, and standardization will allow for data to be aggregated and analyzed on a Service-wide and Department-wide basis. The EEIM will also provide advanced analytical tools that will allow energy professionals at all levels of the Department both to improve their existing operations and identify cost-effective investments. Although the Services will continue to use their individual energy information management systems for the time being, the EEIM will allow us gradually to expand and connect them to create an enterprise-wide system. This Spring, I will release the EEIM vision statement and "capability requirements," so that industry can adapt its commercial off-the-shelf solutions to meet the Department's needs.

### B. Expand Supply of On-Site Energy

In addition to reducing the demand for traditional forms of facility energy, DoD is increasing the supply of renewable and other forms of distributed (on-site) energy on our installations. On-site

energy is critical to making our bases more energy secure. Together with the kind of smart microgrid and storage technologies discussed below, it will allow a military base to maintain its critical operations "off-grid" for weeks or months if necessary.

DoD's installations are well situated to support solar, wind, geothermal and other forms of distributed energy. In response to a congressional directive, my office commissioned a study of the potential for solar energy development on military installations in the Mojave and Colorado Deserts in California and Nevada. The year-long study looked at seven military bases in California and two in Nevada. It found that, even though 96 percent of the surface area of the nine bases was unsuited for solar development because of military activities, the presence of endangered species and other factors, the solar-compatible area on four of the California bases was nevertheless large enough to support the generation of 7000 megawatts (MW) of solar energy—equivalent to the output of seven nuclear power plants.[4]

The study also confirmed the logic of the Department's plan to rely on third-party financing for large-scale renewable energy projects. Third-party financing makes sense because private developers can take advantage of tax incentives that are not available to federal agencies. The Services have been active in pursuing privately financed projects using existing authorities:

- In September, the Army established its Energy Initiatives Task Force to work with the private sector to execute 10+ MW projects at Army installations. The Army hopes to develop around one gigawatt of renewable energy on its installations by 2020, and it has solar energy projects underway at Fort Bliss, TX (1 MW); White Sands Missile Range, NM (4.5 MW); and Fort Carson, CO (2 MW).

- The Navy has used the Title 10 authority in Section 2922a, which allows Power Purchase Agreements (PPA) to extend beyond the usual ten years, to issue a multiple award contract in the Southwest. Using this contract, the Navy has awarded three PPA projects in California, including a 14 MW solar photovoltaic (PV) array at Naval Air Weapons Station China Lake and a 1 MW solar PV array at Marine Corps Air Ground Combat Center Twentynine Palms. The Navy is finalizing a similar contract for Hawaii, which will be used to award projects to install 28 MW of solar PV arrays on Navy facilities, including one on historic Ford Island runway that will look like a runway from the air.

- The Air Force is using the Title 10 authority in Section 2667 to lease non-excess land for the development of large-scale renewable projects, the first of which is under negotiation at Edwards Air Force Base, CA. The Air Force recently completed a 6 MW solar PV project at the Air Force Academy in Colorado Springs, CO, and it plans to double the size of its 14 MW solar PV array at Nellis Air Force Base, NV. Luke Air Force Base, AZ, is partnering with a local company to build an array of 52,000 high-efficiency solar panels. Once complete, the solar project will meet half of the base's electricity needs.

[4] ICF International, *Solar Energy Development on Department of Defense Installations in the Mojave and Colorado Deserts* (January 2012). http://www.serdp.org/News-and-Events/News-Announcements/Program-News/DoD-study-finds-7-000-megawatts-of-solar-energy-potential-on-DoD-installations-in-Mojave-Desert

Many of the DoD sites best suited for renewable energy development are on Department of Interior (DOI) lands that were withdrawn from public use for defense purposes. My office is working closely with DOI to identify and overcome impediments to the development of renewable energy projects on these "withdrawn lands."

To elaborate, since 1958 Congressional approval has been required for a withdrawal of DOI land aggregating more than 5000 acres for defense purposes, and the terms of each such withdrawal, including its duration and purpose(s), are set in statute. Smaller withdrawals, as well as withdrawals made before 1958, have also been made administratively. The key impediment is the issue as to whether, absent explicit authorization in an individual withdrawal, the development of renewable energy on withdrawn lands in excess of the direct energy needs of the military installation concerned is consistent with the purposes of the particular withdrawal. A second impediment is the uncertainty about the continued availability of the land. Developers prefer to know that they can keep their solar arrays or wind turbines on the land for the 20-25 year life of the equipment. Even in a case where DoD has the authority to approve development on withdrawn lands, if the withdrawal period specified in statute expires before the anticipated end of life for the project, the developer can't be certain that Congress will renew the withdrawal (or renew it with the same terms) for a time sufficient to earn an acceptable return on the developer's investment. We are working with DOI to identify those areas where development can proceed unimpeded even as we discuss ways to deal with these impediments.

### C. Enhance Security

The first two elements of the Department's facility energy strategy contribute indirectly to installation energy security, by reducing the installation's need for traditional forms of energy and by expanding the supply of on-site energy generation. In addition, we are addressing the need for greater energy security directly.

#### *Next Generation Microgrids*

A major focus of my office is advanced, or "smart," microgrid technology. Smart microgrids and energy storage offer a more robust and cost effective approach to ensuring installation energy security than the current one—namely, back-up generators and (limited) supplies of on-site fuel. Although microgrid systems are in use today, they are relatively unsophisticated, with limited ability to integrate renewable and other distributed energy sources, little or no energy storage capability, uncontrolled load demands, and "dumb" distribution that is subject to excessive losses. By contrast, we envision microgrids as local power networks that can utilize distributed energy, manage local energy supply and demand, and operate seamlessly both in parallel to the grid and in "island" mode.

Advanced microgrids are a "triple play" for DoD's installations. First, they will facilitate the incorporation of renewable and other on-site energy generation. Second, they will reduce installation energy costs on a day-to-day basis by allowing for load balancing and demand response—i.e., the ability to curtail load or increase on-site generation in response to a request from the grid operator. Most important, the combination of on-site energy and storage, together

with the microgrid's ability to manage local energy supply and demand, will allow an installation to shed non-essential loads and maintain mission-critical loads if the grid goes down.

The Installation Energy Test Bed, discussed below, has funded ten demonstrations of microgrid and storage technologies to evaluate the benefits and risks of alternative approaches and configurations. We are working with multiple vendors so as to ensure that we can capture the benefits of competition. Demonstrations are underway at Twentynine Palms, CA (General Electric's advanced microgrid system); Fort Bliss, TX (Lockheed Martin); Joint Base McGuire-Dix-Lakehurst, NJ (United Technologies); Fort Sill, OK (Eaton); and several other installations.

In addition to funding technology demonstrations, my office has commissioned three studies from outside experts. First, Massachusetts Institute of Technology's Lincoln Laboratory is reviewing all of the Department's work on microgrids from a technical standpoint, and its report will be completed in May. In addition to helping us understand the range of ongoing activity, Lincoln Lab's work will serve to classify different microgrid architectures and characteristics and compare their relative cost-effectiveness. Second, a private organization is just beginning a financial analysis of the opportunities for installations to use smart microgrids and other energy security technologies (on-site generation, load management, stationary energy storage and electric vehicle-to-grid) to generate revenue. Although some installations engage in demand response even with their existing energy systems (typically, a base agrees to use backup generators on a few peak demand days in return for a payment from the local utility), advanced microgrid and storage systems will create opportunities for much more sophisticated and lucrative transactions. Third, Business Executives for National Security (BENS), a non-profit, is analyzing alternative business models for the deployment of microgrids on military installations. As part of that analysis, which will be completed this summer, BENS is looking at the appropriate scale and scope for an installation microgrid (e.g., Should it stop at the fence or include critical activities in the adjacent community?) and at the impediments to widespread deployment.

***Addressing Near-Term Concerns***

Although microgrids will address the grid security problem over time, we are taking steps to address near-term concerns. DoD is participating in interagency discussions on the magnitude of the threat to the grid and how best to mitigate it. Closer to home, we are looking at how to ensure that we have the energy needed to maintain critical operations in the face of a major disruption. Together with the Assistant Secretary of Defense for Homeland Defense and Americas' Security Affairs, I co-chair DoD's Electric Grid Security Executive Council (EGSEC), which works to improve the security, adequacy and reliability of electricity supplies and related infrastructure key to the continuity of critical defense missions. As required by Section 335 of the National Defense Authorization Act (NDAA), and as a result of work by the EGSEC, the Department last year gave Congress a preliminary plan for identifying and addressing areas in which electricity needed to carry out critical military missions on DoD installations is vulnerable to disruption.

In addition to working across DoD, the EGSEC works closely with the Departments of Energy (DOE) and Homeland Security. The three agencies recently created an Energy Surety Public

Private Partnership (ES3P) to work with the North American Electric Reliability Corporation (NERC), whose mission is to ensure the reliability of the bulk power system, and with other private sector entities. As an initial focus, the ES3P is collaborating with four utilities in the National Capital Region to improve energy security at mission-critical facilities.

Finally, my office is updating the DoD Instruction on "Installation Energy Management" (DoDI 4170.11), which provides guidance to installation commanders and energy managers on a range of energy security and energy efficiency matters. For example, we are updating the requirements for fuel distribution plans to ensure that emergency generators can operate for a sufficient time.

### D. Leverage Advanced Technology

As the discussion of microgrids illustrates, one of the ways DoD can lower its energy costs and improve its energy security is by leveraging advanced technology. Technological innovation has been DoD's comparative advantage for 200 years, as evidenced by the military's leadership in the development of everything from interchangeable machine made parts for musket production to the Internet. Technological innovation is no less important when it comes to facility energy.

#### *ESTCP's Installation Energy Test Bed*

To leverage advanced technology relevant to facility energy, three years ago my office created the Installation Energy Test Bed, as part of the Environmental Security Technology Certification Program (ESTCP). The approach is similar to one ESTCP has used since 1995 to demonstrate innovative environmental technologies on DoD sites so as to help them transition to the commercial market. ESTCP and its sister program, the Strategic Environmental Research & Development Program (SERDP), have a strong track record of reducing DoD's environmental costs.

The rationale for the Installation Energy Test Bed is straightforward. Emerging technologies offer a way to cost effectively reduce DoD's facility energy demand by a dramatic amount (50 percent in existing buildings and 70 percent in new construction) and provide distributed generation to improve energy security. Absent outside validation, however, these new technologies will not be widely deployed in time for us to meet our energy requirements. Among other problems, the first user bears significant costs but gets the same return as followers. These barriers are particularly problematic for new technologies intended to improve energy efficiency in the retrofit market, which is where DoD has the greatest interest.

As the owner of 300,000 buildings, it is in DoD's direct self-interest to help firms overcome the barriers that inhibit innovative technologies from being commercialized and/or deployed on military installations.[5] We do this by using our installations as a distributed test bed to

[5] The key is scale. If we demonstrate 10 new technologies and three of them don't work out, we can deploy the other seven and still get a large return on our investment given the size of our inventory. Thus, we accept risk on individual projects in order to achieve a return across the program as a whole. For the same reason, Walmart, the largest private sector energy consumer in the United States, operates its own test bed, systematically testing innovative energy technologies at designated stores to assess their performance and cost effectiveness. For technologies that prove out (not all of them do, which is itself a valuable finding), Walmart deploys them in its thousands of stores. This approach has helped Walmart dramatically reduce its energy consumption. But whereas

demonstrate and validate the technologies in a real-world, integrated building environment. Projects conduct operational testing and assessment of the performance and life cycle costs of new technology while addressing DoD-unique security issues. They also provide guidance and design information for future deployment of the technology across installations. By centralizing the risk and distributing the benefits of new technology to all military installations, the Test Bed will provide a significant return on DoD's investment.

For example:

- Watervliet Arsenal, NY, is demonstrating an advanced control system developed by United Technologies Research Center (UTRC) that could increase boiler efficiency by 5 percent. If the system proves out, DoD can deploy it on thousands of boilers and see a meaningful energy savings.
- Fort Benning, GA, is testing a micro-turbine developed by a small start-up firm, FlexEnergy, that can produce electricity from the low BTU-content waste gas characteristic of old landfills. DoD has dozens of old landfills that can use the technology, and there is a potential commercial market as well.
- Great Lakes Naval Training Center, IL, is demonstrating UTRC's "continuous commissioning" technology, which uses automated sensors and advanced modeling to adjust the building controls in real time so as to maintain a building's optimal energy performance. This technology has been used in high-profile buildings to reduce energy use by a third. Our goal is to make it cost effective for deployment at scale.
- Fort Irwin, CA, is demonstrating advanced lighting controls developed by Philips Research North America that can reduce indoor lighting costs in DoD buildings by nearly half through sensors, intelligent controls and networking (remote monitoring and control of multiple sites and connection to the smart grid).
- The Air Force, at one of its facilities in the humid Southeast, will test an HVAC system that incorporates a patented nanotechnology membrane developed with funding from DOE's Advanced Research Projects Agency-Energy (ARPA-E) program. Made by Dais Analytic, the "NanoAir" technology can de-humidify outdoor air without cooling it, thus lowering energy consumption by as much as half and reducing the size of the HVAC equipment needed.
- Marine Corps Air Station Miramar in San Diego, CA, will demonstrate electrochromic windows, which tint electronically to reduce solar heat gain, thus allowing a building to get by with a smaller cooling system and eliminating the need for window shades.[6] We

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Walmart's focus is narrow because all of its stores are identical (big-box design), the military needs solutions for a diverse mix of building types and sizes—everything from barracks to aircraft repair depots.

[6] Electrochromic windows illustrate the impediments to commercialization of technologies for building energy efficiency. The major benefit of these windows will be the capital equipment savings from using a smaller HVAC system. Architecture and engineering (A&E) typically are responsible for sizing the HVAC system for a new building. No A&E firm will take the risk of installing a smaller chiller, however, without compelling evidence that these windows will work as promised. Although DOE has helped fund the development of the technology and venture capitalists have invested in it, the cost remains high and the demand limited. Our large-scale demonstration can help reduce the impediments to widespread commercialization by providing rigorous data on technical and economic performance as well as qualitative information on occupant comfort and productivity. If DoD in turn becomes an early customer for electrochromic windows, that will further help jumpstart the market.

will install the windows, made by the start-up firm, Soladigm, on three sides of a building to validate the technology at scale and to see whether the building occupants like it.

(See http://serdp-estcp.org/Program-Areas/Energy-and-Water/Energy for additional examples.)

The Test Bed, which selects projects based on a rigorous competition, has more than 70 demonstrations underway in five broad areas:

- Advanced microgrid and storage technologies, such as the projects at Twentynine Palms and Fort Bliss;
- Advanced components to improve building energy efficiency, such as advanced lighting controls, high performance cooling systems and technologies for waste heat recovery;
- Advanced building energy management and control technologies;
- Tools and processes for design, assessment and decision-making on energy use and management; and
- On-site energy generation, including waste-to-energy and building integrated systems

The projects funded in FY10 will begin reporting results this year.

The timing for an Installation Energy Test Bed is ideal.[7] The federal government has invested significant resources in energy R&D, largely through DOE, and the private sector is making even larger investments as evidenced by the growth of venture capital backing for "cleantech." As a structured demonstration and validation ("dem-val") program linked to the large DoD market, the Test Bed can leverage these resources for the military's benefit.

In addition to leveraging DOE funding indirectly, ESTCP is partnering directly with DOE's SunShot Initiative, which aims to reduce the total cost of solar energy systems by 75 percent by 2020. SunShot will shortly announce the winner of its technology competition, and ESTCP has agreed to demonstrate the technology at the 1 MW scale on two separate bases as part of the Installation Energy Test Bed. DOE will provide the PV modules to the bases at no cost, and ESTCP will pay for the balance of system and its installation on the bases. The bases will get a cutting-edge solar array at a discount, and DOE will benefit from having its chosen technology tested at scale in a real-world setting with the prospect of the military as a major customer.

ESTCP is also exploring ways to partner with DOE's Building Technologies program, which funds R&D to improve the energy efficiency of commercial buildings. (A number of the technologies being demonstrated in our Test Bed received DOE funding at an earlier stage in their development.) Such a partnership is potentially powerful. DoD could take more direct advantage of the advanced technologies that DOE is funding, and DOE would get the lessons learned from real-world testing of its technologies. Moreover, the prospect of a demonstration on a military base may introduce more "demand-pull" into DOE's R&D process, which has been criticized for being too reliant on "technology push."

[7] One indication of that is the extraordinary response we have had from industry. ESTCP's FY12 solicitation for the Test Bed drew 600 proposals from leading companies in the building energy sector, small startups with venture capital funding and the major DOE labs. Although the Test Bed could afford to award funds to only 27 of the proposed projects, a number of the applicants were encouraged to reapply for FY13 funds.

Although the Installation Energy Test Bed represents a modest investment—DoD's FY13 budget includes $32 million for energy technology demonstrations under ESTCP[8]—it is a high-leverage program that the Department believes will produce major benefits. At last month's ARPA-E conference, Deputy Secretary Ash Carter and MIT President Susan Hockfield both underscored the importance of using DoD's 500+ installations and 300,000 buildings as a test bed for technologies the Department wants to see commercialized. And in a report released yesterday on "Energy Innovation at the Department of Defense," the authors highlighted "the proven effectiveness of two very different but highly effective innovation models: the widely extolled Defense Advanced Research Projects Agency [DARPA] and the Strategic Environmental R&D/Environmental Security Technology Certification programs [SERDP/ESTCP]."[9]

***Other Steps Needed to Leverage Advanced Technology***

There are other ways in which the Department is leveraging or could leverage advanced technology to further its facility energy strategy. Let me briefly describe two that require additional action to be effective.

*Collection of High Quality Data on Building Energy Consumption:* The lack of good data on building energy performance is the single biggest impediment to achieving the objectives of our facility energy strategy. Even new buildings do not perform in keeping with the design goals, and their energy performance degrades over time. Without near-continuous building-level energy consumption data, however, it is hard to identify the problems and assess the opportunities for investment. Detailed building audits can provide the needed information, but they represent only a snapshot at the time of the audit and are so expensive as to be prohibitive.

High quality data on building energy performance is the building block for investment and innovation. The biggest opportunity lies in coupling these data streams with advanced modeling technologies and emerging diagnostic tools that can both identify cost effective opportunities to retrofit our buildings and improve their use of energy during operation.

The actions my office will take this Spring—issuing an updated metering policy and releasing the vision and requirements for the EEIM system—represent an important next step. It is just that, however—more needs to be done. Most important, the Services need to budget for new meters and install them expeditiously in keeping with the new policy. Moreover, building on the Navy's innovative approach, the Department needs to settle on a cyber-secure way to connect its (smart) meters so that the information they provide can be monitored and analyzed centrally—whether by the installation commander or at the Service headquarters.

*Reduction of Risk to Third-Party Financers of Advanced Technology:* As discussed above, the Department plans to rely heavily on third parties to finance its investments in energy efficiency (ESPCs and UESCs) and renewable energy (PPAs, Enhanced Use Leases). Currently, these

[8] We are also requesting $43.9 million for ESTCP for *environmental* technology demonstrations. These two demonstration programs appear as separate lines under ESTCP in the FY13 budget.

[9] Consortium for Science, Policy and Outcomes and the Clean Air Task Force, "Energy Innovation at the Department of Defense: Assessing the Opportunities" (March 2012).

entities have an incentive to minimize risk on individual projects, which leads them to use older, well-proven technology. However, as the owner of 300,000 buildings and thousands of acres of solar-compatible land, the Department has an incentive to take advantage of newer, less-proven technology, which can dramatically reduce energy demand or generate renewable energy at significantly lower cost. Just as with the ESTCP Test Bed, new technology represents a risk at the individual project level, but at the program level—i.e., looked at across the entire Department—it can significantly increase the return on investment.[10]

This is a recognized issue with ESPCs and the Energy Savings Companies (ESCOs) that perform them. The clearest evidence comes from ESCOs that are part of larger companies which are themselves developing technologies to improve building energy efficiency. Rather than use the new technology that its parent company has developed, the ESCO will typically use an off-the-shelf solution so as to minimize financial risk. Renewable energy projects face the same issue: the entities funding power purchase agreements and enhanced use leases have no incentive to use advanced technology that, while offering superior performance, is not well-proven.

The challenge is to reduce the risk to third-party financed projects of incorporating advanced technology that will increase the return on ESPCs overall. We are exploring contractual mechanisms that would allow the Department to reduce the risk to, or share the risk with, the third party. We have had some preliminary discussions with energy financing experts in academia, among others, and we plan to bring in legal and contracting experts as well.

*Potential Deployment of Plug-In Electric Vehicles.* Over the past eighteen months, DoD has sought to determine whether the large-scale procurement of plug-in electric vehicles (PEV's) is financially viable. Led by the Air Force, in close collaboration with my office and the other Services, this effort set an ambitious goal: develop a PEV procurement strategy that meets our requirements at a total cost-of-ownership that does not exceed that for conventional vehicles.

The Air Force has done an extensive analysis of the market, focusing on those segments where DoD can potentially "tip" the market toward lower costs—namely, medium- and heavy-duty trucks. In addition to issuing requests for information and convening two "industry days," the Air Force worked with GSA to model the lifecycle cost and residual value of PEV's so as to assess the financial implications of fleet electrification. It also commissioned MIT's Lincoln Laboratory to do a detailed analysis of the requirements for and cost to install a charging infrastructure at 16 bases. In addition, Lincoln Lab is conducting a cost-benefit analysis of electric vehicle-to-grid (V2G) technologies, which would allow an installation to sell power from electric batteries back to the grid.

In addition to doing extensive analysis, the Air Force has announced plans to make Los Angeles Air Force Base the first federal facility to replace its entire general purpose fleet with PEV's. With funding from the ESTCP Installation Energy Test Bed, Lawrence Berkeley National Laboratory and others will demonstrate new fleet management and V2G software at the base.

The jury is still out—we are awaiting the conclusion of Lincoln Lab's research and some additional analysis. However, the preliminary results of the 18-month analysis suggest that there

[10] In fact, even for an individual ESPC hat said, the kinds of technologies that we would like to see ESPCs incorporate are typically lower risk than the ones we demonstrate as part of the Installation Energy Test Bed.

is a way to procure a large number of PEV's at cost parity with conventional vehicles, where "large" is defined as 1000-2000 vehicles per year at each of 20-30 installations. If those promising results hold up, we will issue an RFP (request for proposals) in the coming months.

## II. Progress on Statutory and Regulatory Goals

There are four key statutory and regulatory goals related to installation energy and water:

- 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 Act of 2007]. Under DoD's High Priority Performance Goals, the interim target is a 21 percent reduction by the end of 2012.
- Increase use of renewable energy to 7.5 percent in 2013 and beyond [Energy Policy Act of 2005]; and produce or procure 25 percent of electricity consumed from renewable sources by the end of 2025 [2007 NDAA]. Under DoD's High Priority Performance Goals, the interim NDAA target is 12 percent by 2012.
- Reduce consumption of petroleum (gasoline and diesel) by non-tactical vehicles by 30 percent by 2020 [Executive Order 13514, October 2009].
- Reduce potable water consumption intensity by 2 percent per year, or 16 percent overall, by 2015 from the 2007 baseline [Executive Order 13514, October 2009].

In 2011, the Department made progress on all four goals but it fell short of its statutory and regulatory goals for energy intensity and renewable energy.

- DoD reduced its energy intensity by 2 percent—a meaningful improvement but less than the 3 percent needed to meet the annual goal. Overall, DoD has reduced its energy intensity by 13.3 percent since 2005, compared to the cumulative goal of 18 percent.
- With respect to the NDAA renewable energy goal (produce or procure 25 percent of all electricity from renewable sources by 2025), DoD lost ground, going from 9.6 percent to 8.5 percent. The drop was partly the result of a policy decision to buy fewer Renewable Energy Credits.[11] It also reflected a decline in the output of the 270 MW geothermal facility at the Navy's China Lake installation.
- DoD continued to reduce its consumption of petroleum, reaching a cumulative reduction of 11.8 percent since 2005—just shy of the 12 percent goal.
- DoD reduced its potable water intensity (measured as consumption per gross square foot) by 10.7 percent from 2007 to 2011—well above the goal of 8 percent.

[11] The purchase of renewable energy credits (RECs) is an alternative to the actual development of renewable energy; DoD has decided to meet the goals by adding supply on its installations as opposed to buying RECs.

## III. Renewable Energy and Transmission Siting

Although most transmission and renewable energy projects are compatible with the military mission, some can interfere with test, training and operational activities. Until recently, the process by which DoD reviewed projects and handled disputes was opaque, time-consuming and ad hoc, resulting in costly delays. Spurred in part by Congress, the Office of the Secretary of Defense created the DoD Siting Clearinghouse to serve as a single point of contact within the Department on this issue and to establish a timely and transparent review process. The goal is to facilitate the siting of energy projects while protecting test, training and operational assets vital to the national defense.

The results are impressive: to date, the Clearinghouse has overseen the evaluation by technical experts of 506 proposed energy projects; 486 of these projects, or 96 percent, have been cleared, having been found to have little or no impact. These 486 projects—more than half of which were backlogged when the Clearinghouse was created—represent 24 gigawatts of potential energy from wind, solar and geothermal sources. The 20 projects that have not been cleared are undergoing further study, and we are working with industry, state and local governments, and federal permitting and regulatory agencies to identify and implement mitigation measures wherever possible.

In addition to reviewing projects, the Clearinghouse has conducted aggressive outreach to energy developers, environmental and conservation groups, state and local governments, and other federal agencies. By encouraging developers to share project information, we hope to avert potential problems early in the process. We are also engaged in Interior's efforts to open public lands and the Outer Continental Shelf to renewable energy generation—ensuring that we do this in a way that preserves military testing, training and homeland defense capabilities.

The Clearinghouse is being proactive in looking at regions where renewable energy projects could threaten valuable test and training ranges. For example, DoD has commissioned a study to identify areas of likely adverse mission impact around China Lake and Edwards Air Force Base in California, and Nellis Air Force Base and the Nevada Test and Training Range in Nevada. These installations are the Department’s premier sites for test and evaluation and require a pristine environment clear of interference. The results of the study will be used to inform stakeholders of areas where DoD is likely to oppose the siting of wind turbines and solar towers.

The Clearinghouse is also working across the Department and with other federal agencies on R&D to promote mission compatible renewable energy, with an emphasis on technology to mitigate the impacts of wind turbines on radars. We have teamed with the Departments of Energy and Homeland Security and the Department of Transportation’s Federal Aviation Administration to model the impact of turbines on surveillance radars, evaluate alternative mitigation technologies, and expedite the fielding of validated solutions.

Finally, the Clearinghouse is taking advantage of Section 358 of the FY11 NDAA, which allows DoD to accept voluntary contributions from developers to pay for mitigation. The Clearinghouse and the Navy recently negotiated an agreement that provides for the developer to pay the cost to mitigate the impact of wind turbines on the precision approach radar on a runway at Naval Air

Station (NAS) Kingsville, TX. The agreement facilitates the continued growth of wind energy generation along the Texas Coastal Plain while providing for the safety of student pilots at NAS Kingsville and NAS Corpus Christi. We believe there will be many other situations in which a developer is willing to pay the relatively small cost of mitigation in order to realize the much larger value of the project. Section 358 is an extremely useful, market-based tool that allows us to negotiate those win-win deals.

## IV. Conclusion

Thank you for the opportunity to testify on the Department of Defense's strategy for reducing the energy costs and improving energy security on our fixed installations; DoD's performance with respect to the major statutory and regulatory goals related to energy and water; and our efforts to ensure that the siting of transmission and renewable energy projects on and around DoD facilities is compatible with mission activities. I look forward to working with you in the months ahead on these important initiatives.