Statement of Deputy Under Secretary of Defense for Installations and Environment

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Thank you for the opportunity to testify on behalf of the Department of Defense (DoD) on Executive Order 13514, "Federal Leadership in Environmental, Energy and Economic Performance." My testimony today will focus on the Department's energy performance. As the Deputy Undersecretary of Defense for Installations and Environment, I oversee policy and programs related to energy use on our permanent military bases at home and overseas. My testimony will also address the other broad category of Defense Department energy use—namely, combat systems and other support for our combat forces.

My message today is straightforward: the Department has stepped up the long-term effort needed to reduce our high level of energy consumption, and this effort is driven first and foremost by mission considerations. 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.

Executive Order 13514 is a tool to help us turn these vulnerabilities around. As one indication, the Department is developing an aggressive target under the Order for reducing our greenhouse gas emissions, which are due overwhelmingly to direct energy use. For the military, these reduced emissions will represent major gains in energy efficiency. Operational energy is necessarily exempt from any regulatory 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.

Level and Cost of DoD Energy Consumption

The Department 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 and other tactical vehicles, as well as by the generators that provide heating and air conditioning in our forward operating bases in Iraq and Afghanistan. The second broad use of energy is to support the 507 fixed installations we operate in the United States and overseas, which comprise more than 300,000 buildings and 2.2 billion square feet of space. "Facilities energy" consists largely of traditional energy sources used to heat and cool these buildings. It also includes fuel for the 160,000 non-tactical vehicles used at our installations. Although the role of fixed installations historically was to train and deploy our combat forces, they increasingly have a more direct link to combat operations, by providing "reachback" support for those operations or as a staging platform for homeland defense missions.

In 2008, the Department of Defense consumed 890 trillion BTUs. That represents more than half of the federal government's energy consumption but less than one percent of total U.S. energy consumption.

Focusing just on petroleum-based energy, DoD consumes more than 300,000 barrels of oil a day, or about 1.7 percent of the total for the United States and about 0.35 percent of the world's total oil consumption. The Air Force burns 70 percent of that oil—roughly the same amount as United Airlines.

In 2009, DoD spent $13.4 billion on energy—about the same as in 2007. Of that, 72 percent ($9.6 billion) went for fuel for operational energy and 28 percent ($3.8 billion) for facilities energy. In 2008, our energy bill was 50 percent larger ($20 billion), due largely to higher oil prices. The recent volatility of the oil market, with prices ranging from $50 to $150 per barrel, has played havoc with our budgeting process.

For fuel used in the theater of war, the real cost is even higher than the price implies because it is so expensive to transport and protect the fuel. A large fraction of the tonnage carried by convoys is fuel and water, and in the winter months it can take up to 45 days to move supplies from a port in Pakistan through tribal areas to our end users in Afghanistan. Convoys are the largest and most vulnerable target for insurgent attacks. The more convoys we send, the greater the need for protection and, in turn, for supplies to support the protective forces. Taking into account this long logistics "tail," the real cost of fuel used in theater—we call it the "fully burdened cost of fuel"—can be an order of magnitude higher than the commodity price.

Although fixed installations and non-tactical vehicles currently 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 the major source of greenhouse gas emissions by the military.

Energy-Related Security Challenges

The U.S. military's reliance on oil and other fossil fuels poses four broad security challenges. The first is the *growing risk to operating forces*. Attacks on our supply lines in Afghanistan and Iraq are increasingly sophisticated and effective, resulting in a growing number of casualties. The ability of potential adversaries to attack our fixed energy supplies and delivery forces will continue to improve. In short, our fuel inefficiency endangers our troops and threatens our missions.

A second challenge is the *insecurity of the global commons.* Most petroleum products are transported by sea, and much of this trade passes through vulnerable chokepoints such as the Straits of Hormuz and the Straits of Malacca. The free flow of energy through these vital channels may be threatened by piracy, political instability or military action. Thus, fuel inefficiency is a strategic as well as a tactical threat.

A third challenge has to do with *oil supply, demand and price volatility*. Tightening global oil supplies and political instability within some oil-producing nations created significant price volatility in recent years, raising our costs and making budget and acquisition decisions more difficult. The challenge will increase as the growing demand for energy—particularly in Asia—outstrips projected oil production and refining capacity.

A final challenge is *grid vulnerability.* DoD's reliance on a fragile commercial grid to deliver electricity to its 500-plus installations places the continuity of critical missions at risk. 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. Because of U.S. combat forces' increasing reliance on "reachback" support from installations in the United States, power failures at those installations could adversely affect our power projection and homeland defense mission capability. For example, we operate Predator drones in Afghanistan from a facility in Nevada and analyze battlefield intelligence at data centers here at home. This means that an energy threat to bases at home can be a threat to operations abroad.

Progress to Date

Although our goal of energy security will require a long and focused campaign, and while much more remains to be done, the Department has made meaningful progress. In keeping with the requirements of the 2009 National Defense Authorization Act, DoD has created the office of Director for Operational Energy Plans and Programs in the Office of the Secretary of Defense. 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 standing up their energy offices as well and they are developing detailed strategic plans. 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. His plans include fielding a completely sustainable carrier strike group (nuclear vessels and ships powered by biofuel), dubbed "the Great Green Fleet," by 2016, and producing half of the Navy's installation energy requirements from renewable sources by 2020.

To achieve operational energy reductions, the Department has tripled investment in energy security technology over the last four years, from $400 million to $1.2 billion. We are investing heavily to improve aircraft engines, which account for a large fraction of all operational energy consumption. One promising project is the Highly Efficient Embedded Turbine Engine, based on a high-pressure ratio, high-temperature core turbine technology that should reduce fuel consumption by 25 percent and also be applicable to commercial aircraft. The Army is developing technology to reduce the fuel consumption of tactical ground vehicles such as the HMMWV by 30-40 percent. And DARPA is spending $100 million on an 18-month project to develop affordable algae-based synthetic fuels.

Generators used to provide heating, ventilation and cooling (HVAC) at forward operating bases are another major consumer of operational energy. In 2008, we began spraying insulating foam on tents, trailers and other temporary structures in Iraq, and later Afghanistan, with dramatic results: the energy consumed for HVAC dropped by more than 50 percent. In one demonstration, we insulated 9 million square feet of temporary structures and reduced daily fuel demand by more than 77,000 gallons, which meant 13 fewer trucks convoying fuel each day. We're testing a more advanced approach, Net-Zero, that would allow a forward operating base to create all the power it needs within its own perimeter fence—largely through renewable energy.

With respect to fixed installations, the Department has pursued a two-part investment strategy that is designed to (1) reduce the demand for traditional energy while (2) increasing the supply of renewable energy sources. In addition to the Department's military construction budget, financing for these investments has come from our Energy Conservation Investment Program, Energy Savings Performance Contracts and mechanisms such as Enhanced Use Leases and Power Purchase Agreements.

Efforts to curb demand—through conservation measures and improved energy efficiency—are by far the most cost-effective way to improve an installation's energy profile. A large fraction of our energy efficiency investments go to retrofit existing buildings; typical retrofit projects install high efficiency HVAC systems, energy management control systems, new roofs and improved lighting. We are also taking advantage of new construction to incorporate more energy efficient designs, material and equipment, using LEED Silver standards as a guide. From 2005 to 2008, we reduced the energy intensity of our facilities by 11 percent through conservation and investment in energy efficiency.

On the supply side, 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 using a public-private partnership. 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. Nellis saves $1 million a year in electricity costs and avoids 24,000 tons of carbon dioxide emissions. In October, the U.S. Army Corps of Engineers signed an agreement with two private companies to develop a 500-MW solar power plant at Fort Irwin in California's Mojave Desert. The plant will be built using an Enhanced Use Lease—a mechanism that allows the private partners to finance the

estimated $1.5 billion in capital costs. 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.

Key Initiatives Going Forward

The shift to clean energy and reduced energy consumption will entail a fundamental change in the culture of the Defense Department, which has traditionally viewed energy as both cheap and plentiful.[1] In addition to strong leadership from the top, that change will require a shift in current decision making processes, incentives and requirements. Let me summarize five key initiatives we are implementing to bring about this fundamental change.

The Department is implementing two far-reaching changes so that when we write requirements for and acquire our weapons systems, we take into account the full cost and logistical burden of the energy required to operate the systems. First, we are instituting the *Energy Efficiency Key Performance Parameter* (KPP). A KPP is a set of requirements that the Department specifies for any new weapons system it sets out to acquire. Although our requirements process has traditionally addressed the range, weight and payload of any new system, decision makers have implicitly assumed that the fuel logistics available to support our combat forces was adequate and secure. Recognizing that this longstanding assumption is no longer valid, the Energy Efficiency KPP will incentivize those setting requirements for weapons systems to limit the operational burden imposed by the new system's energy needs.

Second, once the requirements are set, the acquisition process will take into account the financial burden that energy requirements would impose—i.e., the *Fully Burdened Cost of Fuel* (FCBF). As I discussed above, there is a significant cost to providing the logistics and force protection for those systems and platforms that require fuel, and those costs are not currently captured in the weapons acquisition process. The Department is developing the methodology to estimate the average cost per gallon of fuel under different scenarios and to incorporate this cost analysis into its formal evaluation of alternatives.

These two decision tools—the Energy Efficiency KPP and the Fully Burdened Cost of Fuel analysis—complement one another and together represent a systemic change to the way we make decisions that affect our energy demand. If effectively implemented, they will represent a new way of thinking about how we wage war. Energy consumption will no longer be an unquestioned assumption; it will be seen as a strategic and tactical vulnerability.

We are encouraged by the initial use of the Fully Burdened Cost of Fuel concept, in the Army's analysis of alternatives for its Ground Combat Vehicle and Joint Light Tactical Vehicle. Given the long life cycle of our weapons systems, it will take years for this new approach to produce

[1] "More Fight-Less Fuel," Report of the Defense Science Board Task Force on DoD Energy Strategy, February 2008; and "Powering America's Defense: Energy and Risks to National Security," Center for Naval Analysis, May 2009.

dramatic results. Over time, however, we believe it will result in a more efficient and effective war-fighting capability.

Third, 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 an effort 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.

Fourth, DoD's fixed installations offer an ideal *testbed for next-generation energy technologies* coming out of industry, Department of Energy and university laboratories. 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 ("valley of death") between research and deployment. These include technologies to improve the conservation and efficiency of building energy, on-site renewable energy generation, distributed energy resources, and control and management of local energy loads. As both a real and a virtual testbed, our many facilities could assess the technical validity, cost and environmental impact of these advanced, pre-commercial technologies. Moreover, for those technologies that prove effective, DoD could serve as an early customer, helping create a market, as it did with aircraft, electronics and the internet. That would allow the military to later leverage both cost savings and technology advances from the private sector. We are using the energy testbed approach on a small scale and hope to expand it, working closely with the Department of Energy among other organizations. This 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.

Finally, 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. 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 islands that support restoration of the grid in the event of disruption.

In a recent report on DoD's energy strategy, 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.

Conclusion

The Defense Department is developing an aggressive target for reduction of greenhouse gas emissions under the new Executive Order. This action reflects mission considerations above all: the military's heavy reliance on fossil fuels is both a tactical and a strategic vulnerability, the costs of which are exacted in dollars, lives and reduced mission effectiveness. The target we're setting under the Order will be a tool for helping us turn this vulnerability around. Although operational energy is exempt from the target, operational activities will be a major beneficiary of our efforts to reduce the Department's energy consumption consistent with the target.

The Department has made progress in improving its energy efficiency, and we are undertaking new initiatives to address the flawed processes and incentives that continue to drive our inefficient use of energy. Although much remains to be done, we are committed to making bold changes. These changes will not simply enhance the environment, they will significantly improve the effectiveness our military mission.