CHAPTER 13

THE ARMY'S APPROACH TO INSTALLATION AND OPERATIONAL ENERGY SECURITY CHALLENGES

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The United States is facing significant challenges, including those of a political nature, as it strives to maintain energy security. A recent White House Champion of Change recipient stated that veterans voicing their concern over clean energy and climate change might help the country rise above the political divide of these issues being right or left, politically speaking, and make sure they are instead **American** issues. Indeed, all Americans must act as catalysts for the change that is necessary for a sustainable future.

To this end, the U.S. Army has taken a number of significant steps. Before outlining them though, it is important to place the Army's energy use in perspective. The U.S. Army manages almost one billion square feet of building space. It has over 100,000 homes on its bases that are utilized by 2.2 million Soldiers, families, and civilians. U.S. Army installations and posts around the world are comparable to 152 small cities. With this amount of people and infrastructure, the U.S. Army has the distinct privilege of being the largest facility energy consumer in the Federal government, at a cost of $1.3 billion dollars in Fiscal Year (FY) 2012. The Army spent another $3.5 billion in FY12 on liquid fuel to support overseas contingency operations. In addition to being one of the U.S. top consumers of energy, the Army supply chain requires a significant amount of water and generates a significant amount of waste.

The Army cares about its sizable energy footprint because its ability to accomplish its mission depends on secure, uninterrupted access to energy, water, and other natural resources, both at home and abroad. Energy supply shortfalls and power distribution failures represent a strategic vulnerability—increasing risk to specific missions, the U.S. Government's pocketbook, and the Army's reputation. Ensuring energy security through increased efficiencies and diligent management of resources reduces this vulnerability.

Today, the U.S. Department of Defense (DoD) faces multiple threats and nontraditional challenges, all of which jeopardize the future security environment. The Army's intelligence community reports that the key element of the complex future operating environment will be the "Lack of Governance or Rule of Law." Driving this breakdown in governance will be an increasing, world-wide demand for scarce resources. The rise of oil prices, scarcity of water, unstable weather conditions, and effects of climate change will increase global tensions.

Climate change will also have physical effects on military installations through sea level rise and drought. It impacts soldiers by constraining training options and increasing safety and occupational health risks. The increase in natural disasters will translate into more missions for soldiers at home, especially those in the National Guard and Army Corps of Engineers. Whether it is Army Soldiers or a joint effort, the Army frequently provides support to civil authorities in emergency response and recovery operations, for example by evacuating residents from the Colorado floods, supporting tornado relief and reconstruction efforts in Oklahoma and Illinois, and assisting the Hurricane Sandy victims all along the East Coast.

Climate change has also increased the number of humanitarian missions overseas. For example, the U.S. military recently distributed over 650,000 pounds of critical supplies to survivors of Typhoon Haiyan in the Philippines.

In response to these threats, DoD is working to build a resilient Army that can adapt rapidly to change. A more flexible and adaptable Army is more capable of performing its mission in a resource-constrained environment. Army installations will become platforms of stability, resiliency, and endurance. These platforms will promote highly-efficient electricity usage, on-site power and water generation, and integrated "smart" microgrid infrastructure.

Appropriately managing resources and consumption is a challenge the Army has been addressing through technologies, policies, and programs, such as the Net Zero Initiative. Since 2011, this initiative has been the cornerstone of Army energy security and sustainability efforts. Through the principles of integrated design, the Net Zero strategy strives to bring the overall consumption of energy, water, and waste on Army installations down to an effective rate of zero. The Army defines a Net Zero Energy Installation as an installation that reduces overall energy use, maximizes efficiency, implements energy recovery and cogeneration opportunities, and then offsets the remaining demand with the production of renewable energy from on-site sources. A Net Zero Energy Installation produces as much energy as it uses over the course of a year. Army installation energy managers understand that achieving Net Zero requires a systems-of-systems, holistic approach. Therefore, Net Zero efforts include water and waste because it takes energy to pump, treat, distribute, collect, and dispose

of water resources; and it takes energy to transport and properly dispose of waste.

Sharing lessons learned from several test-bed pilot installations is important because the Army is planning to eventually expand the Net Zero challenge to all permanent installations and forward operating bases. Best practices include conducting thermal building envelope analysis, implementing leak detection on the potable water distribution system, and improving purchasing practices to reduce or eliminate waste at the source. In the coming years, the Army's collective challenge will be to adopt and embed these types of best practices into all the Army does.

The success of the Net Zero Initiative will be based on collaboration. Partnering with third parties has contributed to the Army's reduction in energy use intensity and allowed the Army to focus on its core competencies. Many Federal agencies, small businesses, and innovators have contributed to the progress to date. Partnering helps the Army improve energy security. Installations and surrounding communities have experienced increased power outages due to a vulnerable electric distribution system. In the last 10 years, the Army has seen over a four-fold increase in power interruptions on its bases. Due to the need for expansive maneuver areas, Army installations are typically isolated and at the end of utility lines. By reducing consumption and increasing renewable energy projects, the Army increases energy security; reduces vulnerability in the event of power outages; and reduces utility bills that increase much faster than inflation.

In an environment of declining budgets, it is the Army's responsibility to stabilize and/or reduce its energy costs. Every project must have a positive eco-

nomic benefit over the course of its life-cycle. Each of the military services has committed to generate one gigawatt of renewable energy on military installations by 2025. This is equivalent to the electricity needed to power over 750,000 U.S. homes. To achieve this end, the Army established the Energy Initiatives Task Force (EITF). The EITF serves as the central managing office to plan and execute large-scale, renewable energy projects greater than 10 megawatts on Army installations. The EITF leverages private-sector financing and expertise to gain access to up-front capital investments in return for a long-term power purchase agreement.

In support of the EITF, the U.S. Army Corps of Engineers initiated a Multiple Award Task Order Contract (MATOC) to identify a pre-approved list of project developers in four technology areas: geothermal, solar, wind, and biomass. The total contract ceiling across all four technologies is $7 billion and allows for maximum flexibility for use by other military Services and Federal agencies. The MATOC is one of the contract vehicles and procurement options that will help the Army in its efforts to plan and execute a cost-effective portfolio of renewable energy projects. While the MATOC was in the procurement process, the Army has moved forward on seven projects. These projects represent more than 175 megawatts of power, which is almost 20 percent of the Army's goal, and many of them began implementation in 2014.

Behind the initial EITF project releases, the Army has a pipeline of four gigawatts of potential projects that it is currently assessing or validating. Some of these projects may be halted or delayed due to market conditions or as a result of further critical analysis. As projects are validated and advance through the pipe-

line, new opportunities are selected from the Army enterprise to begin initial assessment.

In addition to utilizing renewable energy, improving energy security begins with improving energy efficiency. The U.S. Army is leveraging limited budget dollars with private sector funding through energy savings performance contracts (ESPCs) and utilities energy services contracts (UESCs) to implement energy conservation measures on Army bases. Performance-based contracting enables the Army to partner with Energy Service Companies and utilities, which finance efficiency projects and are repaid from the value of energy savings realized from their investment over the life of the contract.

In 2011, President Barack Obama issued a performance contracting challenge, which directed the Federal Government to award $2 billion in new ESPCs and UESCs over a 25-month implementation period, ending December 31, 2013. During that time frame the Army was the only Federal entity to exceed its goal significantly. The Army executed and awarded $498 million in contracts, which was 29.7 percent above its $384 million goal. The projects are projected to save 1.396 trillion British Thermal Units per year through such measures as lighting upgrades and controls, building envelope improvements, central energy plant upgrades, and modifications to energy intensive process equipment. Building on success, President Obama has issued a second challenge to all federal agencies, and the Army continues to leverage alternative means of financing to help overcome budgeting uncertainties.

Microgrids are an innovative solution to improving energy security and resiliency on Army installations. The combination of on-site energy generation

and storage, together with a microgrid's ability to manage local energy supply and demand, allows installations to shed nonessential loads and maintain mission-critical loads if the electric grid goes down. The Army has invested in a smart-charging microgrid outside the headquarters of Wheeler Army Airfield in Hawaii. The system consists of 25 kilowatts of solar power, 200 kilowatt-hours of battery storage, and four plug-in electric vehicle charging stations. The system can power electric vehicles and has the ability to provide instant backup power to support three buildings for 72 hours. These buildings are able to operate totally independent of the commercial power grid.

Fort Carson, Colorado, is home to another microgrid, which includes a bidirectional vehicle-to-grid pilot project. The bidirectional charging units are capable of providing up to 300 kilowatts of power to plug-in electric vehicles and can also discharge a similar amount of stored energy from the vehicle batteries to the grid or microgrid. Power stored in the vehicle batteries provides energy security and increases transmission efficiency from the local utility through a power correction factor.

In addition to integrating vehicles, renewable energy, and backup generators into the energy management systems at permanent installations, the Army is also working to integrate such technologies and capabilities at contingency locations and forward operating bases (FOBs). On the battlefield, the Army is partnering with the other military services to ease the aggregate burden of powering the tactical edge, while still providing the amount of power and resources required by soldiers. Fuel and water comprise 70 to 80 percent of ground resupply convoys, by weight, and represent significant risks to Army missions and U.S.

Soldiers. Resource-informed principles, such as Net Zero, become particularly important at contingency bases where operations emanate from austere environments and are supported by extended supply lines traveling through hostile terrain.

For example, a U.S. FOB in Afghanistan was receiving a regular aerial resupply that consisted of 70 percent fuel and water. Every 3 days, American Soldiers needed to stop their primary mission, and come down out of their secure mountaintop location to establish an area for the air-drop. They then had the task of taking the supplies back up into their protected operating base. The Army sent an operational energy team in for 30 days to examine the base's fuel and water usage, and, with the team's recommendations, the Army was able to get that base down to one resupply every 10 days, with 30 percent fuel and water. By enhancing mission effectiveness in this way, the Army helped to ensure its Soldiers are less vulnerable, that they are exposed to less risk, and that they are able to focus on their primary mission.

New technologies are being tested at home and in combat theaters that will increase mission agility through better power management and more flexible power sourcing. The Army has been able to establish tactical microgrids, new and more efficient generators, and onsite renewable power at combat outposts and FOBs due to the type of testing and evaluation that takes place at the Base Camp Integration Lab at Fort Devens, Massachusetts. Soldiers now carry 9.7 pounds of rechargeable batteries, as compared with 14 pounds with back-ups, for a 72-hour load. Innovation that reduces fuel demand and resupply requirements undoubtedly increases mission effectiveness.

Despite these successes, there are ongoing challenges from the financial, technical, and social standpoints. DoD has had to work under continuing resolutions for at least some portion of each fiscal year for the past several years. This funding uncertainty makes investment decisions much more difficult.

Additionally, there are challenges in terms of how to value energy security. Installing energy efficient products and microgrids reduces risks and vulnerabilities, but comes with a tradeoff and cost. Traditional cost-benefit analyses can help assess an energy project; however, quantifying the risks involved with failures to energy supply and power distribution systems requires nonmarket valuation. This is beyond the scope of traditional cost-benefit analyses and proves to be a challenge in the budget appropriation process because of competing priorities.

President Theodore Roosevelt stated, "Far and away the best prize that life has to offer is the chance to work hard at work worth doing." The U.S. Army will continue to work hard to build financial and technical partnerships with third parties and defense communities, because this will help it remain "Army Strong" despite the many energy security challenges facing it today.