

Public Works DIGEST

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and Waste**

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TriEco-Tetra Tech Sustainable Resources Joint Venture of San Diego and Hunt Electrical of Salt Lake City workers at Dugway Proving Ground, Utah, place the grid studs and crossbeams that will hold the solar panels of the \$7.7 million solar power array project. Photo by Bonnie A. Robinson.



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Army offers right tools for energy, water conservation

by Patrick Walsh

Ranging from the Energy Conservation Investment Program to self-help with Utilities Privatization, Utility Energy Services Contracting, Energy Savings Performance Contracting, Energy Engineering and Analysis Program, QUTM, Resource Efficiency Manager, Commercial Utilities Program and local sustainment, restoration and modernization in between, the Army's energy and water conservation toolkit offers solutions to many of the issues we face on an installation.

I was Fort Knox, Kentucky's energy manager back in the mid-1980s – the Stone Age of the Army Energy Program. I can attest firsthand to the huge leap in status and emphasis for installation energy programs. Funding programs (outside of ECIP) were almost non-existent in the “old days.” Installation leadership was supportive of, but not necessarily engaged in, the installation energy program. Times have changed. We now have funding support options, installation, and Army leadership pro-actively engaged in the energy program. An example of this at Fort Knox is when Col. B.J. Constantine Jr. became the Human Resource Command Chief of Staff two years ago, one of the first office calls he set up was with the installation energy manager. This is significant considering HRC is in a 900,000 square-foot office complex occupied by more than 4,000 personnel. The Energy Office worked closely with HRC staff and building energy managers in developing a project to capture waste heat generated by a large data center to heat the offices in the complex. Later, an ECIP project constructed a geothermal pond in a large retention basin that catches runoff from a 41-acre parking lot and 339,000 square-foot roof area. The pond offered highly efficient cooling when coupled with the heat pumps in the complex. When HRC recently achieved Energy Star level building performance, after being one of the most energy-intensive office buildings on post five years ago, the Honorable Katherine Hammack, Assistant Secretary of the Army for Installations, Energy and Environment was there to celebrate the achievement with HRC personnel.

The Fort Knox Energy Team, consisting of installation personnel and government contractors, was developed to fulfill the requirements of the mandates to reduce federal building energy consumption in the original Energy Policy Act of 1992. A UESC was established in 1996 (expired in 2013) and it, along with electric, waste water, and water UP contracts were the primary drivers to leverage private sector capital and energy conservation expertise in a public/private sector cooperative effort to reduce energy and water consumption at Fort Knox. We are working with the U.S. Army Corps of Engineers, Engineering and Support Center, Huntsville to award an ESPC to continue to tap private sector expertise and capital to meet federal and Army mandated energy reduction goals.

As the Fort Knox Energy Team was developing long-term strategies, there were four directives given to the team: (1) support the military mission, (2) improve air quality in facilities to make them healthier for Fort Knox personnel, (3) save energy and water, and (4) improve occupant comfort by repairing building envelopes and controlling wide interior temperature swings caused by poor heating, ventilating, and air conditioning control.

After our initial evaluation, we determined to focus our efforts on HVAC systems in building. Due to outdated technology and state of disrepair, HVAC system replacement offered significant energy savings and the opportunity to improve indoor air quality by designing systems to meet American Society of Heating, Refrigerating, and Air-Conditioning Engineers ventilation standards.

Boilers, heating distribution, and HVAC control systems at Fort Knox were in very poor condition. Boiler rooms were filled with steam, and heat distribution lines were marked by dead grass swaths along the surface path of the lines. Not only was energy being wasted (open windows in the winter were used to control over-heated rooms), the maintenance dollars used to keep the marginal systems operating were

Acronyms and Abbreviations	
BEM	Building Energy Managers
CUP	Commercial Utilities Program
ECIP	Energy Conservation Investment Program
ESPC	Energy Savings Performance Contract
HRC	Human Resource Command
HQ	Headquarters
HVAC	Heating, ventilating and air conditioning
QUTM	Accounting Label for a special subset of SRM funds
MW	Mega-watt
SRM	Sustainment, Restoration and Modernization
UESC	Utility Energy Services Contract
UP	Utilities Privatization
USACE	U.S. Army Corps of Engineers

being wasted. Lack of funding for effective maintenance and training even led to newer equipment failing prematurely. We were throwing good money after bad and had no tools to get out of the death spiral. Under these conditions, developing the economic framework for UESC projects was relatively easy. Due to the attractive payback on these projects, funding items within the UESC such as connections to the central control system, extended maintenance to keep equipment operating optimally and increase equipment life, and installing smart meters was possible. There was also evidence that Fort Knox should go “all in” on highly efficient ground coupled heat pump HVAC systems. The climate and soil thermal conductivity make Fort Knox an ideal location for this technology. This approach led to almost 7 million square feet of building space with ground coupled heat pump HVAC and the elimination of more than 100 boilers on the installation. With this technology change, boiler operators and boiler patrols becoming unnecessary over time resulted in additional personnel savings.

Fort Knox privatized its water distribution system in 2012 after years of attempting to do so. Investment in the maintenance of ➤



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the system, beyond day-to-day, was halted around 2005 in anticipation of the UP, and many years went by with only minor maintenance being performed. Capital improvement projects recently completed on up to 70-year-old components of water plants, storage, and distribution systems have resulted in significant reductions (up to 50 percent) in monthly water usage.

Over the years we also realized we had to quit being our own worst enemy. The improvement of SRM funding, including QUTM funding, through the 2000s led to many building and HVAC renovation projects at Fort Knox. The Army's standard guide specs in the early 2000s were not our friend when it came to energy conservation as we were not greatly improving building envelope and equipment performance by using them. The Fort Knox Energy Office developed an "energy spec" locally to make sure we were gaining energy efficiency in building renovations. These requirements were also shared with USACE, who were open to discussing the requirements. Many of our earlier changes are now standard for the Army.

When smart meters were mandated for federal buildings over 29,000 square feet, Fort Knox had already accomplished half of the requirement. We then partnered with Huntsville Center, who was looking for a "quick win" for the Army Central Metering Program, to complete the requirement, and Fort Knox became the Army's first installation to meet the smart metering mandate. The effort was completed in December 2010, almost two years ahead of the deadline. As we started obtaining data from the smart meters to monitor and document energy consumption, it became apparent we had a lot of data but no way to utilize it. We also determined that we had many facilities under 29,000 square feet that used more energy than some of the smart metered buildings over 29,000 square feet. We opted to continue installing meters on energy-intensive buildings down to 7,500 square feet to gain better intelligence on where our energy was being

used. Today we actively monitor more than 600 meters. Recording the metered data without utilizing it in daily decision making would be a waste. We worked with our UESC contractor to obtain analysis software to collect smart meter data through the post-wide Trane Tracer Summit building automation system and use a Trane program called Intelligent Services to analyze data and develop reports, including monthly individual building energy "report cards" that are presented to BEMs. This allowed the team to track year-after-year performance in individual facilities and led to the decision to pursue Environmental Protection Agency Energy Star certification for many of our facilities. The Energy Star building labeling program is one of the most recognized building energy performance benchmarking programs and is based on the actual energy performance of a building. This results in a third party verification of our building energy performance. The culmination of this effort has been the attainment of 50 Energy Star certified buildings since 2009, putting Fort Knox at the top of the nation for the number of Energy Star facilities for small communities. Remarkably, many of the buildings achieving Energy Star status were constructed in the 1930s and 1940s, which demonstrated the effectiveness of our energy retrofit protocol. There is a lot of positive publicity generated with the public seeing an Energy Star plaque at the main entrances to the post headquarters, the garrison HQ, other highly visible facilities, and one of the largest office buildings in the Army.

Effectively utilizing the tools the Army has provided has allowed a large variety of conservation initiatives to occur at Fort Knox and resulted in an installation that can go completely off the grid if necessary, yet the most valuable tool has yet to be mentioned. Some of the worst energy consuming buildings on Fort Knox have been brought to zero consumption through the Army's centrally-funded demolition program. Fort Knox has demolished more than 1 million square feet of inefficient building space over the past 10 years and in the process moved installation personnel




The Human Resources Command complex is shown with the geothermal pond in the foreground.

into much better and more energy efficient space.

What does the future hold? With three combined heat and power plants totaling 8 mega-watts, other on post electrical generation capability, 3.67 MW of solar power, a post-wide smart grid, on-installation water and gas production capability, on-installation waste water treatment facility and a direct connection to the Texas Gas Transmission line running through the installation, Fort Knox is energy and water secure. Fort Knox utilizes some of these assets to reduce demand charges on utility bills. We have enlisted the aid of the Huntsville Center's CUP to enter into a discussion with our electric supplier about our rate structure. The rate structure has been in effect since 1966 and needs to be changed to reflect changes to installation energy usage and take advantage of the assistance we can provide our electric supplier at high demand times or during emergencies by taking our electric load off their system. Our ability to be self-sustaining during emergency conditions will also benefit the local community as the local utility supplier can concentrate on other customers while Fort Knox operates off the grid. This will enhance the Army's reputation of being a good neighbor to the local communities near Fort Knox.

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Base of Tomorrow concept a model for installation resiliency

by Richard F. Ballard and Kim Mueller

This article introduces the Base of Tomorrow concept being partnered by Dominion Virginia Power and the Department of the Army and implemented at Joint Base Myer/Henderson Hall. This initiative is not just a technical demonstration, but serves as a model for installation resiliency and is thus applicable across the Army and other federal installations. This collaborative effort was developed as a result of analyzing specific vulnerabilities and shortcomings in typical energy delivery systems at Department of Defense installations.

The Concept: An efficient installation that achieves a reliable, resilient, and sustainable energy supply from power generator to end user by incorporating a diverse set of energy solutions in an integrated and optimal way.

The Base of Tomorrow concept recognizes that installation power systems are complex and unique, and that generation, transmission, distribution, and consumption are interdependent. It also acknowledges that proactive master

planning greatly enhances the likelihood of a flexible, efficient, and on-target grid design, and implementation tailored for the specific installation.

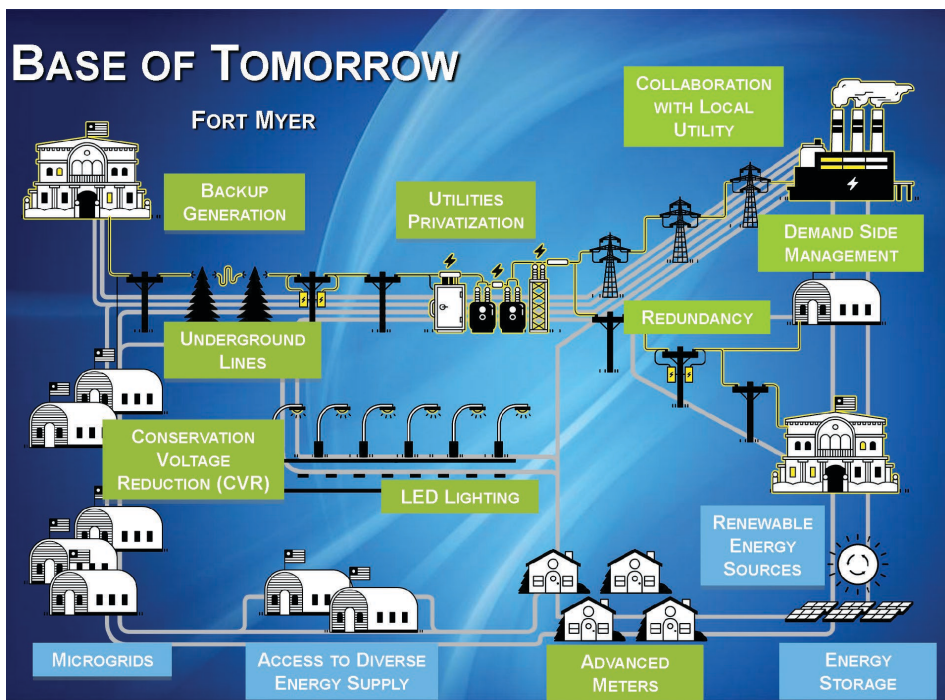
While the Army seeks to enhance its energy delivery at its 154 installations, it has experienced an increase in grid outages in the last decade. This has motivated the Army to focus specific efforts to enhance power and energy delivery. In conjunction with DVP, our public/private collaboration has reduced outages due to equipment failure at Fort Story, Virginia, by 80 percent and at Fort Eustis, Virginia, by 89 percent. At Fort Lee, Virginia, outages have been reduced by 37 percent while supporting \$20 million in utility related Base Realignment and Closure construction there. Privatization initiatives at JBMHH have led to zero outages in 2013, 2014, and year-to-date in 2015. By applying many of the concepts identified in this article, the Army has experienced over a 70 percent reduction in outages at its Training and Doctrine Command installations and within the Military District of Washington in the last few years.

Acronyms and Abbreviations	
AICMGS	Advanced Integrated Control Micro Grid System
CVR	Conservation Voltage Reduction
DOD	Department of Defense
DVP	Dominion Virginia Power
ESTCP	Environmental Security Technology Certification Program
JBMHH	Joint Base Myer/Henderson Hall
MDW	Military District of Washington
MW	Mega-Watt

The steps required to significantly enhance grid reliability, resiliency, and to guarantee sustainable energy supply have been systematically developed at the Army's JBMHH Pilot. These steps include:

- Develop proof of principle;
- Identify and optimize the benefits of an integrated approach;
- Showcase technologies and synergies for further adoption at other locations;
- Host demonstrations to explain the approach;
- Share benefits and results throughout DOD; and
- Devise opportunities for future implementation.

At JBMHH, the Army found DVP receptive to partnering to create a demonstration that systematically developed and fielded the Base of Tomorrow concept. Significant portions of the JBMHH electrical infrastructure had been poorly maintained for decades. Rather than upgrade these piecemeal, the Army desired to comprehensively proceed with modernization. DVP was eager to partner with the Army to this end. Ultimately, the Army determined the best financial path would be to turn the infrastructure over to our electrical power partner – in other words, privatize it. Since 2007, DVP and the Army have invested more than \$50 million into upgrading and renovating this infrastructure. The small load in place at JBMHH allows for a base-wide microgrid of between 5-7 mega-watts. ➤



Base of Tomorrow Concept.



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The location of this installation within the MDW was indicative of the potential for this as well as other Defense assets in the region to be required for national crisis response. Partly for aesthetics (the historical nature of JBMHH and the Arlington National Cemetery mission) but more importantly, to enhance the ability to withstand both severe natural events such as high wind, as well as targeted combatant strikes, led to the decision to underground the entire grid system. Finally, there was the opportunity to create a brand new sub-station at Radnor Heights designed in every way to be able to withstand natural and man-made threats. The acronym created for this concept is called AICMGS, the Advanced Integrated Control Micro Grid System.

The following design features have been incorporated into JBMHH's AICMGS:

- Existing circuits were re-configured to establish four express feeders;
- 90 percent of all underground conductors were replaced;
- 89 percent of the deteriorating duct bank was replaced;
- 86 percent of all switches were replaced; and
- 69 percent of the installation's transformers were replaced.

The demonstration used multiple funding sources including Environmental Security Technology Certification Program (DOD's environmental technology demonstration and validation program); Third Party; and Capital Investment Program project dollars. The demonstration was awarded an ESTCP grant to install Conservation Voltage Reduction and microCVR to optimize voltage to reduce demand and consumption and to maintain voltage within a critical bandwidth. The installation also secured a Utility Energy Services Contract to implement various energy efficiency improvement projects. These included, for example, interior lighting conversions, heating, ventilating, and air conditioning upgrades and control system upgrades. The

Army also replaced inefficient outdoor sodium arc lamp lighting with 580 light emitting diode light fixtures.

Twenty-four diesel powered backup generators, with a total capacity of 9,650 kilowatt-hours (nearly 10 MW), were installed to ensure the grid would continue to operate during a total grid shut-down. These generators provide emergency, redundant power directly to critical facilities. These facilities will be able to be operated in an islanded manner once the Base of Tomorrow implementation is completed, including installation of the paralleling gear.

The proposed AICMGS includes automation of the distribution system, integration of existing generation and the potential integration of micro turbines with combined chilling, heating, and power for long-term sustainability and diversity. It provides the capability to isolate and self-sustain JBMHH against the loss of the electric utility grid. It maximizes use of existing generation and leverages investment in reliable and resilient infrastructure.

Solar photovoltaic panels with battery storage have been proposed on five buildings at JBMHH. This integrates renewables into the system to demonstrate how they can operate in coordination with normal utility supply and with the AICMGS, and demonstrates the benefit of CVR to regulate voltage and compensate for output variability of renewable generation.

Perhaps the "crown jewel" of the JBMHH grid demonstration has been the design, construction, and integration of the Radnor Heights sub-station into the demonstration. At about the time the JBMHH project was being developed, there had been multiple events where individuals had tried to take down substations in the national grid by firing high-powered hunting rifles into the infrastructure. The best site for a new substation at JBMHH was adjacent to a multistory apartment complex where the sun terraces looked directly onto the site. It

was determined that a traditional, above-ground sub-station would be extremely vulnerable to targeting by subversives. The Radnor Heights Sub-Station was designed to be extremely resilient to both deliberate attack and natural catastrophe. This 230 kilo-volt sub-station is entirely underground. It is comprised of three network transmission lines and two source feeds, with four dedicated circuits. The above-ground aspects of the facility combine the most advanced physical security features available today. From the exterior, the facility was constructed to aesthetically blend into the historic and ongoing mission of JBMHH. This system was entirely funded by Dominion which considers the resiliency of their facilities as part of their new infrastructure designs.

Remaining Phases:

- **Energy Sustainability:** The Advanced Integrated Control Micro Grid System has been designed to integrate all the generation and consumption systems into a holistic system that is optimized to enhance resiliency while being adaptive to future mission requirements. The concept envisions multiple microturbines with natural gas combined heat and power, further diversifying the fuel types that sustain the installation.
- **Renewables and Energy Storage:** An underlying assumption is that solar, battery, and fuel cell applications will not be incorporated into the microgrid unless the economics for these systems work – that is, they stand on their own merits. Having said that, the rapid advances that have been and continue to be made in these aspects of energy delivery are indicative that we are at the cusp of being able to move forward to integrate these aspects of the microgrid more completely into the system in the next few years.

What have we learned?

- An integrated approach will improve reliability with over 70 percent ➤



The Sustainability Component Plan: Principles, Processes, Products


by Jerry Zekert and Mark Gillem

In this era of demanding environmental policies, constrained budgets, and a growing awareness of the role planning plays in mission sustainability, engineers and planners need to identify practical ways to reduce impacts associated with energy, water, waste, and stormwater (referred to in this article to as environmental categories). After all, resources spent on purchasing energy and water or managing waste and stormwater could be used more productively on mission needs. While one-off “Energy Master Plans,” “Stormwater Management Plans,” and “Water Conservation Plans” frequently target low-hanging fruit, these plans rarely connect to the larger master plan. This connection is vital if installations want to determine not only how they are doing today, but how they can meet broad environmental goals long into the future. Installations should be able to forecast energy and water consumption, waste generation and

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- reduction in outages.
- Privatization is a key enabler to partnerships. Radnor Heights was a win/win/win.
- JBMHH and other installations whose grids have been similarly modernized have the potential to be staging centers for severe regional storm response.
- Back-up, microgridable generation components are essential to enhance grid reliability.
- There is value in a Utility Energy Services Contract in that it provides support to federal customers while re-engaging our local utility.

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stormwater responsibilities, and identify savings based on an actual plan. This can be done using a Sustainability Component Plan, a supplement to the installation master plan. The best SCPs follow four primary principles:

1. Based on a Master Plan

If done correctly and in conformance to Unified Facilities Criteria 2-100-01, Installation Master Planning, the installation Master Plan or applicable Area Development Plans would have already integrated key principles of environmental sustainability. This is an essential first step in the process.

Energy. Master plans identify buildings that remain, new construction, and demolition. For new construction, the plan should integrate energy reduction concepts from UFC 2-100-01 to include the use of vertical mixed-use buildings to reduce heat loss through multiple roofs, narrow wings for natural lighting and ventilation, and multistory typologies to reduce the amount of exposed building envelope. For buildings that remain, these become excellent candidates for renovation or repurposing. In new and renovated buildings, energy-efficient lights, appliances, and construction techniques are also needed to achieve maximum energy reduction. Buildings planned for demolition can receive minimal attention since the goal is their eventual removal in line with footprint reduction initiatives and consolidation opportunities. After reductions have been maximized, the SCP can map where installation-appropriate energy recovery can occur through photovoltaic, wind, or geothermal systems. Then planners can use predictive modeling to forecast energy consumption and recovery to achieve their energy goals.

Water. As with energy, an SCP can be used to map and forecast appropriate potable water reduction and recovery principles, which may include the use of high-efficiency fixtures in new and renovated facilities, greywater reuse for nonpotable use (i.e., flushing toilets,

Acronyms and Abbreviations	
ADP	Area Development Plan
NZP	Net Zero Planner
SCP	Sustainment Component Plan
UFC	Unified Facilities Criteria

irrigating landscapes, or use in cooling towers), or rainwater harvesting.

Waste. While Americans generate more than 4 pounds of trash per day, less than 35 percent of that waste finds its way to recycling or composting bins. This can be much higher. With more robust recycling programs, the diversion rate can exceed 70 percent and most of the remainder could be used to generate electricity through gasification systems. Similarly, most construction and demolition debris could be diverted from landfills. Fort Hood, Texas, for example, is on its way to becoming a Net Zero waste installation in part by implementing single stream curbside recycling programs and easily located drop-off recycling containers. “We’re trying to have recycling become a part of the culture here,” said Jennifer Rawlings, environmental program manager for the Directorate of Public Works Environmental Division. “It’s part of the newcomers’ brief Fort Hood residents get and part of the training Soldiers go through as part of their unit.”

The SCP documents policies and maps installation-appropriate strategies for waste reduction and recovery and then can forecast reduction rates in support of the installation’s goals.

Stormwater. Addressing stormwater on-site rather than sending it downstream is a primary objective that can be supported by an SCP. The SCP can be used to map reduction principles that include reduced impervious surfaces through more effective planning, the use of applicable pervious surfaces to minimize runoff, and the inclusion of multi-functional green infrastructure elements to capture stormwater before it leaves a site or



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district. These elements can be as simple as street trees selected to absorb rainwater, planting strips between curbs and sidewalks to capture runoff from adjacent streets, planted medians in parking lots, and parks or quads designed as retention or detention facilities. More complex elements can be included if needed such as engineered wetlands, bioswales, or subsurface irrigation and drainage management systems.

2. Leverages Stakeholder Engagement

When users from an installation participate in the creation of an SCP, they take ownership in the outcome. It becomes their shared journey rather than an outsider's imposed solutions. At U.S. Army Garrison Hawaii, for example, Soldiers from the 130th Engineer Brigade collected facility data, mapped sustainability strategies and briefed elements of the SCP to installation leadership. Likewise, at Parks Reserve Forces Training Area, Public Works experts worked with representatives from tenant and mission organizations to develop the SCP. At the outset, stakeholder engagement is essential to develop installation-specific goals for energy, water, waste, and stormwater. Then stakeholders can help map and document the solutions for their installation.

3. Uses Predictive Modeling

To support the SCP process, using predictive modeling introduces a new planning dynamic for energy, waste, and water planning. Existing energy audits look at the past (or the history); while planning and modeling tools look at today and the future. The Army Corps of Engineers' Engineer Research and Development Center's Construction Engineering Research Laboratory has developed Net Zero Planner, a predictive modeling tool that can forecast energy consumption for an installation. It is based on standard facility groups and the application of relevant and cost-effective energy efficiency measures to bring each facility group's

energy use intensity to a specified and affordable level. The NZP tool is being expanded to include water and waste.

4. Produces Executable Projects

One of the most important outcomes of an SCP is the identification of actual, executable projects that are tied to the Master Plan. This includes the demolition of energy-intensive buildings where renovation is cost prohibitive, the application of relevant water, and energy efficiency measures for new construction and renovation, the siting of energy and water recovery projects, the construction of necessary green infrastructure projects to reduce stormwater runoff, and the location of recycling and composting facilities. With projects identified, follow-on prioritization, programming, design, funding, and execution can be more easily accomplished.

The SCP Process

The SCP is developed using a robust, participatory process that begins after an ADP(s) is in place. Then, goals in each of the categories are established. At the same time, existing data are collected and a survey of each facility is completed to establish the baseline use rates for energy, water, and waste. Data from the surveys is input into the NZP tool and cost-effective efficiency measures are determined and applied to a base case, better case and best case for each environmental category on a phased basis (short-term, long-term, and capacity). Planners can then select the appropriate case and prepare the appropriate metrics and plans.

SCP Products


In the end, the SCP results in a useable planning report that documents the findings of the process and maps the principles needed to achieve the installation's sustainability goals. For new construction and renovation projects, specific water and energy efficiency measures are described in detail on a building-by-building basis. Green infrastructure and waste projects are

identified on maps and tied to follow-on project lists. Energy and water use intensity maps are produced that visually document the installation's current condition and desired end-state. All of the maps can then be dropped into the installation's graphic mapping system and the projects can be inserted into the installation's development program.

Conclusion

The SCP is a natural evolution of the master planning process. It takes good planning and then forecasts a more sustainable future based on that planning. And it is not just a theoretical concept. SCPs were initially prototyped at Natick Soldier System Center, Massachusetts, and Fort Hunter Liggett, California. More recently, they have been refined at the Presidio of Monterey, California; Parks Reserve Forces Training Area, Fort Hood; and U.S. Army Garrison Hawaii. The process is so compelling and relevant that NASA's Johnson Space Center, Houston, Texas; and White Sands Test Facility, New Mexico, have adopted the approach. In addition, a highly engaging Proponent Sponsored Engineer Corps Training course has been developed that teaches participants about the SCP. The approach meets Department of Defense future proposed initiatives for energy master planning. Engineers and planners at these locations know that meeting new executive orders, reducing costs and being better stewards of the environment requires an actual plan, and the SCP is emerging as that plan.

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Low cost energy savings achieved through behavior modifications

by Nick Stecky

We all know that funding for energy projects will be very tight in fiscal year 2016. This leaves us energy people with little to work with in this upcoming year. Here is a case study about how a simple, low cost program can deliver large dividends. It is about a simple program, well executed by people determined to make it succeed. It is about changing human behavior and acknowledging and reinforcing good behavior.

This began in New Jersey when Picatinny Arsenal's Resource Efficiency Manager responded to an announcement near the end of FY12 from the Federal Energy Management Program. This was a call for volunteer installations to participate in the FY13 FEMP Federal Better Building Competition, a competition among federal facilities only, based on which building would have the largest percentage reduction in energy consumption, comparing the base year FY12 and the test year, FY13. As it would turn out, although Picatinny placed second in the competition, it learned some very valuable lessons. The FEMP competition would pave the way for a change in human behavior that would remain in effect in the upcoming years.

The REM evaluated a number of possible buildings for the competition and selected Building 65. It had smart meters for natural gas, electricity, and two years of meter readings. It was a 65,000-square-foot, single story structure, occupancy of about 300, and built in 1942. Originally it was an industrial building and later was converted to its present use as administrative offices. In addition, the building occupants were comprised of engineers, scientists, and administrative support staff. The REM believed that if the competition would be explained to them, they would buy into and take ownership of the energy efficiency effort.

The REM met with the Division Chief, Gary Pacella and building manager, James (Jed) Douglas, to present his idea of entering B65 into the FEMP competition.

He explained that if they could successfully engage the building occupants, Picatinny could have a competitive entry. It was thought that human factors and human behavior could be a significant factor in energy savings. "I didn't think we'd make a noticeable difference," Pacella said, but he and Douglas were willing to try.

They met and developed a plan to increase the efficiency of building systems such as lighting and heating, ventilating and air conditioning, and also to get the building occupants engaged in the program and educated as to what contributions they could make. Money for equipment improvements was very limited, but \$10,000 was obtained to make some improvements. This included lighting, occupancy sensors, and removing unnecessary lighting fixtures in over lit areas. All project work was completed by the end of December 2013, but the primary focus would be on modifying human behavior. Pacella and Douglas met with their people, explained the program to them, and won support. Basically it was about turning off unnecessary equipment, especially during unoccupied periods. Douglas became the enforcer, reminding people of the need to eliminate waste. He also came up with an idea to help people in turning off equipment when not needed: battery chargers and power supplies for small devices and general office equipment such as faxes, copiers, and printers. Knowing that most devices have small green light emitting diode lights on when powered up, Douglas developed the "Green Lights Off" program that was promoted throughout the building.

Modification of human behavior was very effective for electricity savings but not natural gas. The study found occupants do have a great deal of control over electrical use, but they have little control over the natural gas consumption that is used for space heating as it is controlled by the building automation systems. Hence there was little improvement in natural gas consumption, but dramatic savings in electricity use which was 21 percent less in FY13 than FY12.

Acronyms and Abbreviations	
FY	Fiscal Year
REM	Resource Efficiency Manager
FEMP	Federal Energy Management Program

The electricity savings has continued into FY14 and FY15, although FY15 shows an increase over FY14 due to an increase in population. Annual electric savings for FY13 versus FY12 were \$13,524, which equates to about 21 cents per square foot of building per year.

Although the 21 cents per square foot electricity savings appears small, applied to all Picatinny conditioned spaces, which is about 3.5 million square feet, the overall savings opportunity based on the results of the B65 program would be about \$735,000 per year. Now that entire amount may be unachievable, but this demonstrates that there is a significant savings opportunity in electricity.

This project's energy saving techniques are readily transferable to other installations. It is human behavior based, not equipment based. Building 65 occupants changed their behavior and transformed into an energy savings culture. There were regular energy savings reports issued by Douglas through emails to all people in B65. The building received a report card every month, charting the progress. Not only were people being asked to save, but they were given feedback as to how successful they were. B65 also demonstrated the development of teamwork, having everyone buy into the need to save. The beauty of this project is that it does not stem from a single action, but instead it is the accumulation of a multitude of small individual actions, working together to provide a large result.

This project's energy saving actions by individuals has become part of the everyday routine for B65 occupants and the savings have continued through to FY15. The measure of the success of the project is that after more than two years, the savings continue. All of the



Fort Bragg goes hot, cold with technology

by Elizabeth I. Gerhart

Preparation has begun at several buildings on post that are receiving energy-efficient improvements to help the installation reduce its “carbon footprint.”

Geothermal heating and cooling systems will be installed in five buildings around Fort Bragg, North Carolina’s historic district. These systems use the earth’s temperature to warm or cool a structure.

“In this case, the mechanical systems in the buildings were aging and in need of an upgrade,” said Melinda Hakeman, Fort Bragg Energy Program planner and a Fayetteville, North Carolina, native. “The mechanical systems will be upgraded and tied into the geothermal wells.”

Preparations to include digging the wells and installing underground piping systems began in June.

The systems use wells and pipes to circulate a water glycol solution through a closed-loop system. In the summer, heat is removed from the building and absorbed by the ground. In the winter, it works the same way, only in reverse.

The \$13.3 million project is centrally funded through the Department of Defense’s Energy Conservation and Investment Program and is scheduled to be completed by September 2016.

The geothermal systems will supplement the mechanical heating and cooling systems within the buildings, allowing them to work more efficiently. Energy efficiency is critical to reducing cost by

lowering energy consumption.

“It is extremely important for us to reduce our energy consumption because that helps reduce energy costs,” Hakeman said.

Fort Bragg uses geothermal technology at other locations throughout the installation.

“Presently, there are many buildings on Fort Bragg that utilize the geothermal technology in the form of ground source heat pumps,” Hakeman said. “The new NCO academy has a large geothermal well underneath the parking lot which serves both the academy and the barracks. Ground source heat pumps are utilized where life-cycle cost effective. The energy team assesses application of energy efficiency and renewable technologies on an ongoing basis.”

According to Executive Order 13693, Planning for Federal Sustainability in the Next Decade, improving environmental performance and sustainability, priority is placed on reducing energy use and cost, and finding renewable and alternative energy solutions.

Fort Bragg’s energy team is tasked with executing these federal mandates to reduce energy consumption and the evaluation and implementation of renewable energy technology.



An excavator operator removes dirt from a trench in preparation for geothermal technology installation at Fort Bragg, North Carolina, Aug. 7. Photo by Elizabeth I. Gerhart.

Acronyms and Abbreviations


DOD	Department of Defense
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“Energy intensity reduction is accomplished through technology and people,” Hakeman said. “The energy team develops energy projects to reduce our energy intensity as well as working with building occupants to share best practices in energy conservation.”

According to the DOD Annual Energy Management Report, Congress has mandated that by 2025, 25 percent of the DOD’s energy consumption must come from renewable sources. The U.S. Department of Energy estimates that the geothermal systems generally use 20 to 25 percent less electricity than conventional heating and cooling systems. Additionally, they are about 40 percent more efficient in the winter than regular heat pumps.

“This is our job and anything we can do to help reduce energy intensity is a positive thing for this community,” Hakeman said.

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Elizabeth I. Gerhart is a public affairs specialist with the 1st Sustainment Command (Theater) at Fort Bragg, North Carolina. 

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(continued from previous page)

measures that were instituted remain in place. Douglas continues with the Green Lights Off program, the savings progress is communicated to the occupants, and we continue to reinforce these good behaviors.

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Nick Stecky is the Resource Efficiency Manager at Picatinny Arsenal in New Jersey. 



Combined heat, power technology raises energy efficiency

by Nicole Hernandez

A new 8-megawatt Combined Heat and Power plant will replace the Harford County Waste-to-Energy Plant municipal solid waste burning facility at U.S. Army Garrison Aberdeen Proving Ground, Maryland, in 2016.

The new CHP plant is part of an Energy Savings Performance Contract project, providing APG a critical thermal energy solution at the Edgewood cantonment area by implementing cogeneration or combined heat and power technology. This solution is vital to replace the capabilities of the local WTE Plant, which currently generates 70 percent of the Edgewood Area's steam requirements. The WTE Plant is owned and operated by the Northeast Maryland Waste Disposal Authority, but decommissioning will begin in March 2016, when the existing steam supply contract ends. The Edgewood Area supports crucial Army research, development, testing, and evaluation facilities that directly support national security missions.

The CHP solution takes advantage of the existing thermal infrastructure at Edgewood and supports the intent of Presidential Executive Order 13624, the Army's Net Zero Energy Initiative, the U.S. Army ESPC Indefinite Delivery/Indefinite Quantity, contract and the Federal Energy Management Program. The Environmental Protection Agency has also modeled the efficiency and environmental benefits of CHP.

The new plant will use CHP technology to cogenerate steam and electric using a turbine similar to a jet engine. The turbine will burn natural gas to generate electricity, and waste heat from the turbine will also generate steam. The steam will supply APG facilities with heat, hot water, and humidity controls.

Following construction of the new plant, the installation will produce more steam than the previous capacity of the WTE plant. In addition, it will generate half of Edgewood's electric load, making it much more efficient than traditional boilers.

Acronyms and Abbreviations	
AFFECT	Assisting Federal Facilities with Energy Conservation Technologies
APG	Aberdeen Proving Ground
BG&E	Baltimore Gas and Electric
CHP	Combined Heat and Power
DOE	Department of Energy
DPW	Department of Public Works
ESPC	Energy Savings Performance Contract
FEMP	Federal Energy Management Program
WTE	Waste-to-Energy Plant

Boiler steam production works at a rate of 51 percent efficiency, from the burning process to energy output. A plant that uses CHP technology, however, works at 75 percent fossil fuel efficiency, a 24 percent increase.

Greenhouse gases and other pollutants are reduced because the CHP consumes less fuel than separate electric and steam plants to produce the same amount of energy. This is largely due to the ability of the CHP to recover and utilize heat that is wasted at a conventional electricity generation plant. Estimates place the emission reductions at 22,571 tons per year of carbon dioxide when compared to technologies that are more traditional.

Along with the construction of the CHP plant, there will be steam line work involving repair and replacement of existing infrastructure and installation of new infrastructure to supplement the existing network.

An ancillary community benefit to the project is the change in the truck traffic. The usual high volume from trash trucks transporting waste out of Edgewood will disappear with the closing of the waste burning facility.

APG's CHP Plant is financed through an ESPC. The project's implementation is expected to cost \$36,666,812, but will subsequently yield \$4,486,024 in annual savings. This will result in a simple pay back of 8.17 years with a performance period of 18 years.

Electricity is currently purchased



Aberdeen Proving Ground, Maryland, state and industry leaders break ground for the new Combined Heat and Power plant at APG South (Edgewood) May 27. From left, APG Garrison Commander Col. Gregory R. McClinton; Mark Case, of Baltimore Gas and Electric; Barry Fabr, Johnson Controls project manager; Sam Kabl, representing Maryland State Sen. Robert G. Cassilly; APG Contracting Officer Representative Jeffery Presgraves; APG Senior Commander Maj. Gen. Bruce T. Crawford; Michael Leslie, Maryland Energy Administration; and Benjamin Grumbles, Secretary of the Environment for the Maryland Department of the Environment. Photo by Stacey Smith.



Resource Efficiency Managers on hand to assist installations

by Ralph Totorica

Did you know that Headquarters, Installation Management Command has had two Resource Efficiency Managers on board to assist IMCOM installations now for three years? They are based out of Fort Sam Houston, HQ IMCOM offices, and will travel to IMCOM installations to assist installation energy managers with executing their energy programs. HQ IMCOM provides this support primarily for smaller IMCOM installations.

Our REMs assist installations with energy audits for Energy Independence and Security Act 2007 compliance, identify energy and water conservation measures, assist with the development of projects for appropriated funding (QUTM and/or Energy Conservation Investment Program) and alternative financing (Energy Savings Performance Contracting and/or Utility Energy Service Contracting), evaluate energy usage patterns, identify demand impact on utility bills, evaluate building

automation systems and provide training for users, provide assistance with the Building Energy Monitor program, and assist with development and review of Project Prioritization System projects. HQ IMCOM REM support is provided at no cost to the installation; however, the host installation must provide access to surveyed facilities.

To date, the REMs have completed site visits to 25 garrisons. During these visits they have audited more than 16 million square feet of facilities and identified 776 energy conservation measures with a total annual savings of \$7.9 million and an energy savings of 634,000 British thermal units. Typical energy conservation measures identified include heating, ventilating and air conditioning improvements (air handling unit, variable air volume box, variable frequency drive, chillers, boilers, etc.), controls improvements (scheduling, retro-commissioning, temperature resets, graphics, and upgrades), lighting retrofits,

Acronyms and Abbreviations	
Btu	British thermal unit
ECM	Energy Conservation Measures
HQ, IMCOM	Headquarters, Installation Management Command
LCNC	Low Cost No Cost
REM	Resource Efficiency Manager

water retrofits, and building envelope improvements. ECM payback averages 3.6 years. A summary of ECMs identified to date through the REM program is provided in Table 1.

For installations that have a requirement for a full-time REM, HQ IMCOM has an enterprise-wide REM contract in place that can be used by IMCOM installations to procure REM services. The contract is administered by the Mission and Installation Contracting Command-Fort Sam Houston. IMCOM installations are required to utilize this central contract for obtaining their REM services.

To request a REM visit to your installation, or to utilize the HQ IMCOM enterprise-wide REM contract, or to merely request additional information, please contact the author at the POC information below.

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Ralph Totorica is a general engineer in the Energy and Utilities Branch, Public Works Division, Headquarters, Installation Management Command. 

Table 1. Summary of REM Visits in FY 2013 - 2015

Total ECMs	Total Cost (Dollars)	Annual Energy Savings (MBTU)	Annual Savings (Dollars)	Simple Payback (Years)	Square Feet Audited (KSF)	Annual Low Cost No Cost Savings
776	\$28,630,903	634,450	\$7,959,402	3.60	16,307,000	\$3,145,212

(continued from previous page)


through a competitive commodity vendor with the assistance of the Defense Logistics Agency, Energy Division. The local regulated utility, Baltimore Gas and Electric, supplies the electricity to the installation and required an interconnection agreement because the proving ground is now generating electricity on BG&E's power grid.

A portion of the funding for the project came from a funding

opportunity provided by FEMP titled, "Assisting Federal Facilities with Energy Conservation Technologies," whose purpose is to provide grants for the development of capital projects to increase the energy efficiency and renewable energy investments at federal agency facilities. APG was awarded \$682,770 from the AFFECT grant for the CHP project. In addition, APG qualifies for a CHP incentive rebate from BG&E totaling \$2.5 million. This is the maximum rebate available and the largest rebate ever given

for CHP construction in Maryland. More information about the CHP incentive can be found at <http://www.bgesmartenergy.com/business/chp>.

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Nicole Hernandez is an ORISE Fellow with the Directorate of Public Works, Environmental Division at Aberdeen Proving Ground, Maryland. 



Awareness, conservation assessments identify ways to cut energy use

by Ralph Totorica

Each year, the Headquarters, Installation Management Command centrally funds energy awareness and conservation assessments at IMCOM installations. The assessments help IMCOM garrisons identify no-cost and low-cost energy savings opportunities and provide energy conservation awareness training for the garrison leadership and community. The intent is to capture quick wins through energy savings opportunities that the garrison can execute immediately with little to no investment costs.

The assessment is a valuable tool available to garrisons to evaluate their current energy consumption patterns and increase energy awareness throughout the installation community. In addition, the assessments assist garrisons with meeting the requirement to perform energy audits on 25 percent of covered facilities each year. HQ IMCOM conducts these assessments at each IMCOM garrison on a four-year rotating cycle.

The assessment consists of a one-week site visit by a representative from IMCOM and an energy consultant under contract for technical support. The week starts with introductory meetings with the garrison commander and director of Public Works. Following discussion with the installation energy manager to discuss objectives and expectations, the contractor reviews utility cost and consumption data and identifies buildings to be surveyed in

Acronyms and Abbreviations	
HQ IMCOM	Headquarters, Installation Management Command
POC	Point of Contact


coordination with the energy manager. The contractor then conducts four days of building surveys, including a night assessment, looking for energy saving opportunities with a focus on low-cost measures and operations and maintenance improvements that can be easily implemented with in-house resources.

Following the building surveys, the contractor prepares site-specific presentations with details of the surveys and presents observations at training sessions for building energy monitors, commanders and staff, and DPW personnel. A good turnout from the installation community at the presentations is key to success of the effort.

In addition to identifying specific energy conservation measures, the assessment also offers a great opportunity for the energy manager to increase energy awareness through their Public Affairs Office. The energy awareness and conservation assessment concludes with an out-brief to the garrison commander and directors.

The assessments are conducted at no cost to the installation; however, the host installation must provide support to escort the contractor and provide access to facilities to be surveyed. To obtain additional information or to request an energy awareness and conservation assessment for your installation, contact the author at the POC information below.

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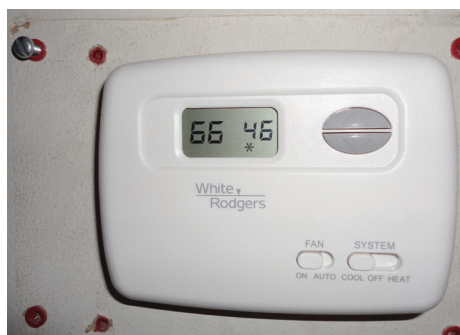
Ralph Totorica is a general engineer in the Energy and Utilities Branch, Public Works Division, Headquarters, Installation Management Command. 

Top five easy steps to correct energy hogs:

1. Validate building daily and weekend occupancy schedules, plus holidays, and check the night setback heating and cooling temperature setpoints.
2. Verify heating and chilled water resets are being used to avoid over-cooling or heating.
3. Ensure kitchen exhaust hoods are shut down when not in use.
4. Place equipment controls in automatic – if they don't work in auto, get them repaired. This avoids variable frequency drive motor controllers running full speed, air handler fans on all night, etc.
5. Eliminate daytime exterior lighting; repair photo-sensors, place entry lights on motion/photo sensors, replace high pressure sodium lamps with compact fluorescent lamps.

Top five things occupants can do to help energy conservation:

1. Place thermostats at proper temperature settings.
2. Program thermostats for daily and weekend occupancy schedules, including night setback temperatures.
3. Turn off office lights, shut down computer and peripherals, turn off other personal items such as fans, chargers, radio, coffee pots, adapters, etc. Better yet – put them on a power strip and just turn off one switch when leaving.
4. Turn in service orders for entry doors that don't fully close or windows and doors that have gaps due to missing weather-stripping.
5. Remove unauthorized items, including space heaters, window air conditioners, personal refrigerators and computer Uninterruptible Power Supply.



Thermostat shows improper heating and cooling setpoint for heating, ventilating and air conditioning system. Courtesy photo.



Working toward energy, water conservation goals using QUTM

by Simon Muench

What is QUTM Funding? The Army's operations and maintenance activities are budgeted under a general pot of funds referred to as OMA - Operations and Maintenance Army. These funds are further apportioned into two basic sub-activity groups: Base Operation Support and Sustainment, Restoration, and Modernization. QUTM is not an acronym but rather an accounting label for a special subset of SRM funds set aside for government-owned utility modernization and energy and water efficiency projects. These funds help garrisons meet conservation and renewable energy goals specified in the many policy documents and requirements (e.g., Energy Policy Act of 2005, Energy Independence and Security Act of 2007, etc.) issued by the federal government, the Department of Defense and Department of the Army.

QUTM is not a substitute for routine utility infrastructure maintenance that should be planned and programmed into the garrison's Annual Work Plan within its local SRM budget.

QUTM funds are an excellent way to help your garrison implement key action items of the Installation Management Command Energy Strategy (Operations Order 15-013), including execution of Low Cost/No Cost energy and water efficiency projects. Currently, IMCOM garrisons are achieving only 75 percent compliance with this element of the strategy (compared to 73 percent last year). Submitting LCNC projects through the QUTM program is one way to increase compliance with this part of the strategy and meet conservation goals.

FY16 QUTM Project Submittals

All projects must be submitted in the Project Prioritization System based on the QUTM business rules available at: [IMCOM E&U Project BizRules](#) (use your e-mail certificate). HQ IMCOM

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will develop the fiscal year 2016 QUTM 1-to-n project list during the first quarter of FY16. We will request that garrisons submit a custom spreadsheet generated by PPS to ensure that all projects are captured when data for the FY16 list is pulled from PPS.

To ensure your project is considered, a Life Cycle Cost Analysis documenting the simple payback and savings-to-investment ratio must be uploaded into PPS. The Federal Energy Management Program provides online life cycle costing training at: http://apps1.eere.energy.gov/femp/training/course_detail_ondemand.cfm/CourseId=2190.

FEMP also has available building LCCA software that can aid in performing LCCAs and will output an LCCA document at: <http://energy.gov/eere/femp/articles/converted-building-life-cycle-cost-programs>.

Lessons Learned

Simple checks should be made to ensure your projects pass initial screenings. For example, if the reported "Current Working Estimate" divided by the "Estimated Annual Savings" does not equal the "Simple Payback Years," then your project will receive additional scrutiny or may be given a lower priority. If a project number is changed after the initial submittal, it becomes difficult to track and therefore may be overlooked.

Acronyms and Abbreviations	
AWP	Annual Work Plan
FEMP	Federal Energy Management Program
IMCOM	Installation Management Command
ISR	Installation Status Report
LCCA	Life Cycle Cost Analysis
LCNC	Low Cost No Cost
OMA	Operations & Maintenance Army
PPS	Project Prioritization System
QUTM	Accounting label for a special subset of SRM funds set aside for government-owned utilities modernization and energy and water efficiency projects
SRM	Sustainment, Restoration, and Modernization

Project titles must be accurate and succinct. Project narratives must be sufficient to fully evaluate the project and must clarify any unusual or special circumstances.

Unlike energy and water efficiency projects, projects submitted for repair of government-owned utilities systems need not have the prescribed simple payback less than 10 years; though some may have quick paybacks and may even compete well as an energy and water efficiency project.

Also, if there is no Installation Status Report Quality rating listed in the ISR field, explain this in the narrative and address the impact to ISR rating if project is funded. Some utilities systems do not have an ISR rating in the ISR system; in such cases be sure to include in the project narrative an assessment of the estimated ISR rating of the subject utility component.

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Simon Muench is the supervisor of the Energy Projects and Alternative Financing Branch in Headquarters Installation Management Command's Energy and Utilities Division.





Army Reserve recognized for energy saving

by Col. Stewart Fearon

During the Building Owners and Managers Association Conference, the 63rd Regional Support Command received an award for the Lighting Energy Efficiency in Parking Campaign by reducing the energy used from 72,883 kilowatt-hours to 10,883 kwh, a savings of 62,128 kwh or 85 percent reduction at the Military Equipment Parking on Camp Pike, Arkansas.

BOMA is a professional association for 91 U.S. and 17 international organizations that represent owners, managers, developers and leasing professionals of commercial property. They encourage the sharing of best practices in all aspects of building operations and management through publications, conferences, seminars and awards programs.

The LEEP Campaign was sponsored by BOMA to encourage the retrofit of existing parking lights and new lighting with state-of-the-art lighting technologies to reduce maintenance and save energy. BOMA provided online tools and access to the Department of Energy's technical expertise.

The 63rd RSC partnered with Pacific

Northwest National Laboratories and the Army Reserve Installation Management Division Energy Team to earn this award. PNNL is one of 10 DOE labs. Their experts worked with Hays Kinslow and Rickey Johns from the 63rd RSC to identify ways and means to conserve power to comply with Executive Orders 13423 and 13693.

EO 13423, Strengthening Federal Environmental, Energy and Transportation Management, signed by President George Bush Jan. 24, 2007, requires all federal agencies to reduce energy intensity by 3 percent annually through fiscal year 2015. EO 13693, Planning for Federal Sustainability in the Next Decade, signed by President Barack Obama March 19 calls for the reduction of energy intensity in federal buildings by 2.5 percent per year through fiscal year 2025.

The ARIMD Energy, PNNL and the 63rd RSC completed economic analysis and return on investment calculations to determine the best way to expend the limited funding available. One of the quickest pay back projects with the largest energy savings turned out to be replacing traditional lighting in parking lots with

Acronyms and Abbreviations	
ARIMD	Army Reserve Installation Management Division
BOMA	Building Owners and Managers Association
DOE	Department of Energy
EO	Executive Order
KWH	Kilowatt-hour
LEEP	Lighting Energy Efficiency in Parking
PNNL	Pacific Northwest National Laboratories
RSC	Regional Support Command

light emitting diode lights.

“It might only take one person to change a light bulb, but it took dedicated efforts by the many thoughtful leaders of LEEP award winners to demonstrate how much can be gained through advanced, cost-effective lighting technologies in parking lots and garages,” said David Danielson, the assistant secretary for Energy Efficiency and Renewable Energy. “These innovative solutions also enhance safety and improve working conditions for customers, tenants and employees.”

“The 63rd RSC is dedicated to conserving energy, expanding the use of renewable energy and creating sustainable installations as part of our efforts to be good stewards of the environment,” said Michael Stocks, the 63rd RSC chief executive officer.

The LEEP award is a testament to the Army Reserve's support of President Obama's plan to create 20 percent more energy efficiency over the next decade. The efforts of the Army Reserve and their strategic partnerships are having a direct impact on reducing greenhouse gas emissions and the tax dollars spent on energy bills.

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Col. Stewart Fearon is the director of Public Works at the 63rd Regional Support Command.



From left: Michael Myer, Energy and Environment Directorate, Pacific Northwest National Laboratory, and Col. Stewart Fearon, director of Public Works, 63rd Regional Support Command, accept the Lighting Energy Efficiency in Parking award from Kent Gibson, Building Owners and Managers Association Chair-Elect. Photo by Jerry Roberts



Achieve successful advanced metering in five easy steps

by Jesse Marzette III

The original Army Metering Implementation Strategy, developed in response to the Energy Policy Act of 2005, required all federal facilities to be metered with advanced meters for electrical consumption by October 1, 2012, where economically feasible. The Energy Independence and Security Act of 2007 established a fiscal year 2016 deadline for metering of all utilities (including natural gas and steam) serving federal facilities.

To meet requirements set forth by the EPCA 2005, EISA 2007 and relevant Department of Defense guidelines, the Assistant Chief of Staff for Installation Management and Installation Management Command assigned the U.S. Army Corps of Engineers, Engineering and Support Center, Huntsville the mission to plan and execute an Army Central Metering Program across all garrisons/centers for active Army, Army Reserve, and National Guard regions worldwide.

The Army's planned implementation of advanced electric, water, natural gas, and steam meters will result in the direct measurement of the facilities selected for metering under the centrally funded ACMP. The facilities are those that are economically justified in accordance with the Department of Energy and Office of the Secretary of Defense implementing guidance.

- **Electricity:** Install sufficient advanced meters on individual buildings to accurately capture a minimum of 65 percent of electricity use with a goal of capturing 85 percent of electricity use at the installations by the end of FY20.
- **Natural Gas:** Install sufficient advanced meters on individual buildings to accurately capture a minimum of 65 percent of natural gas use with a goal of capturing 85 percent of natural gas use at the installations by the end of FY20.
- **Steam:** Install sufficient advanced meters on facilities connected to

district steam systems to accurately identify individual facility steam use and system losses by the end of FY20.

- **Potable and Non-Potable Water:** Install advanced meters on all water intensive facilities by the end of FY20. At a minimum, facilities include district heat and chiller plants, barracks, galleys/kitchens, dining facilities, swimming pools, gyms, docks, vehicle wash stations, industrial facilities, hospitals, water intensive laboratories, and landscaping systems. Installations will include leak detection on devices on water distribution systems to effectively identify system losses by the end of FY20.
- **Installations with Privatized Utilities:** Installations should partner with utility distribution system owners to share meter data or negotiate acceptable terms for cost sharing of new meter installation. Additionally, each installation shall have the capability to monitor the base-wide energy and water use through an advanced meter shadowing the utility meter or through a data sharing agreement with the utility.

Advanced electric meters report data hourly; advanced mechanical (natural gas, water, and steam) meters report data daily. In addition to the metering executed by the ACMP, Army policy is for Army Commands to fund additional metering where and when economically justified including expansion of the cyber secure meter network infrastructure. Building metering efforts should be coordinated with Huntsville Center.

Step 1. Prepare a Building List for Advanced Metering: Create a preliminary list of your candidate buildings identified for advanced meters. Review the Installation Support Agreements for building utility services (electricity, water, natural gas, and steam) provided to other agencies such as: Credit Unions, Veterans

Acronyms and Abbreviations	
ACMP	Army Central Metering Program
AMP	Advanced Meter Program
DPW	Directorate of Public Works
EISA 2007	Energy Independence and Security Act of 2007
EPCA 2005	Energy Policy Act of 2005
FY	Fiscal Year
IMCOM	Installation Management Command
POC	Point of Contact

Affairs, Army and Air Force Exchange Service, and non-federal organizations that do not have meters currently installed that would otherwise qualify for advanced meters. Review the Real Property Inventory records for the building status (scheduled for demolition, change in functional use, multi-organizational building, etc.). Review the Real Property Planning and Analysis System for the projected use of the candidate buildings. There may be buildings identified for advanced meters that may be disposed of within 10 years.

Step 2. Survey Facilities for Advanced Meters: Perform a physical survey using as-built floor plans and site utility plans (G-tabs) of facilities that qualify for advanced meters. Include energy managers, building energy managers, installation Network Enterprise Center personnel, and building occupants in performing this building survey. The survey will identify utility service entrance locations, covered building gross square foot area, local area network infrastructure and other building site characteristics.

Step 3. Validate Your Building List for Advanced Meter Installation: Validate your list of candidate buildings using the Army's building criteria for advanced meters (29,000 square feet or more; \$35,000 or more in annual energy consumption; primary reimbursable tenants; or where economically feasible). Provide your validated list of buildings that qualify for advanced meters to



Meter Data Management System working to improve data reliability

by Michael Ott

Users of the Army's Meter Data Management System, which captures and reports energy and water consumption by thousands of individual Army buildings, will soon notice several enhancements. The program, managed by the U.S. Army Corps of Engineers, Engineering and Support Center, Huntsville, is working with installations and the U.S. Army Network Enterprise Technology Command to ensure installed meters are reporting data to MDMS.

To create an account and view the data, please visit <https://mdms.army.mil>. Please note a common access card is required to create an account.

Improving meter data reliability is the highest priority. Meters occasionally lose their connection to MDMS and, too often, network restoration has been slow. This results in data gaps and anomalies that

frustrate analysis of energy consumption. The goal is to produce consistent, reliable meter data that energy managers can rely upon.

Data reliability initiatives now underway include:

- MDMS algorithms to distinguish buildings that have trustworthy meter data from those building meters that fail the meter data quality tests
- Algorithms to generate simulated data to fill in short-term meter data gaps (system will depict which data are simulated using extrapolations from previous reliable meter readings)
- Automated notifications of meter network outages to the Army Meter Service Desk
- Information technology technical support including reach back capability to the meter network equipment manufacturers and system integrators to help the Network Enterprise Center restore meter network connectivity

The existing MDMS Help Desk will be transformed into an expanded Army Meter Service Desk to serve as a one-stop resource for all metering issues ranging from meter outages to MDMS software training. The AMSD will provide a complete knowledge base for the MDMS including answers to frequently

asked questions, online instructions

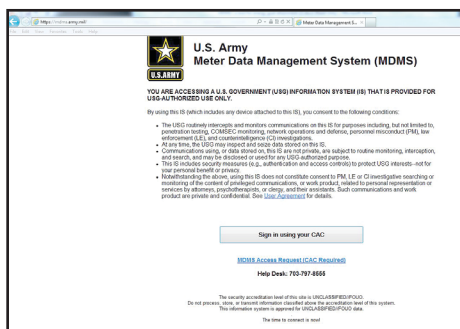
Acronyms and Abbreviations	
AMSD	Army Meter Service Desk
EUI	Energy Use Intensity
MACOM	Major Command
MDMS	Meter Data Management System
NETCOM	U.S. Army Network Enterprise Technology Command
USACE	U.S. Army Corps of Engineers

for troubleshooting meter network interruptions, software training tutorials and a comprehensive point of contact list.

Enhanced analytical capabilities are also being developed for the MDMS. These include the incorporation of Energy Use Intensity benchmarks applicable to five recently constructed building types. This will provide USACE the ability to compare the facility's actual energy performance with the predictive model used in the standard design for each. Lessons learned from this effort can then be applied to a much wider incorporation of appropriate EUI benchmarks by which to compare the energy performance of most building types within the Army inventory.

Other MDMS improvements in the planning/design phase include:

- Geographic information system functionality
- Acquisition of utility company



Meter Data Management System log-in screen

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Huntsville Center and furnish copies to your respective Region Energy Manager and Headquarters, IMCOM Energy Program Manager. Update Real Property Inventory database to show actual number of advanced meters and advanced meter attributes (location, serial number, amperage, etc.) installed on IMCOM garrison owned buildings.


Step 4. Identify garrison Directorate of Public Works Advanced Meter Program Central Point of Contact for Advanced Meters: DPW should appoint

an Advanced Meter Program POC. The AMP POC is responsible for coordinating and scheduling utility service interruptions for advanced meter installation. The AMP POC may identify lay-down areas for contractor materials and equipment. They also provide building access and may perform duties as the technical monitor performing advanced meter installation oversight for advanced meters installed through the ACMP.

Step 5. Advanced Meter Deliverables for Acceptance and Financial Closeout: Advanced Meter training will be provided by the advanced metering contractor

following the installation and acceptance of the advanced meters installed. The installation DPW will be provided Advanced Meter Record Drawings, Operations and Maintenance (shop) manuals, and advanced meter warranty information along with the warranty point of contact information.

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Jesse Marzette is a general engineer in the Directorate of Public Works at Fort Sam Houston, Texas. 



Commercial Utilities Program: IMCOM, USACE work to secure reliable, cost-effective energy supply

by Ernesto Ortiz

Headquarters, Installation Management Command, in cooperation with the U.S. Army Corps of Engineers Commercial Utilities Program, provides technical support to Army installations to secure the most reliable and cost-effective supply of electricity.

HQ IMCOM, in support of the CUP, has performed more than 75 utility service studies over the past 10 years.

Review and follow-up of utility service studies conducted for 42 Army installations from 2004 through 2012 has resulted in the identification of opportunities that have been implemented with significant energy cost savings to the installations.

To enhance the CUP, managers are continuously looking for ways to make improvements to the program. A two-way communication lane has now been

established to maintain a record of the garrisons that have implemented the recommendations and those with actions pending.

Lessons learned have resulted in developing the following methodology to re-energize the program as follows:

- Engage informally with the affected installation for feedback
- Review each utility service study and coordinate with installations
- Compile a comprehensive list of opportunities for all installations
- Verify with each installation if the recommendation was executed
- Ask why recommendation was not implemented
- Ask what the resulting benefits were after implementation period (annual)
- Calculate the cost savings

Acronyms and Abbreviations	
CUP	Commercial Utilities Program
FY	Fiscal Year
HQ IMCOM	Headquarters, Installation Management Command
USACE	U.S. Army Corps of Engineers

- for successfully executed recommendations
 - For viable recommendations that have not yet been implemented, calculate the potential costs savings
 - Issue an HQ IMCOM level Operations Order to formally solicit garrison feedback on the captured benefits from utilities assessments
- Participation from all affected installations is critical to the success of CUP. Engaging key stakeholders and subject matter experts in the implementation of CUP's recommendations can help garrisons succeed in realizing

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meter data to show an installation's total consumption in relation to the total consumption by all metered facilities

- Incorporation of renewable energy generation meters
- User selectable parameters for setting energy consumption alarms and notifications
- Ability to query only tenant facilities and all facilities belonging to a particular major command including those located on other installations
- Potential transition to commercial-off-the-shelf software for state-of-the-art meter data analytics
- Network optimization studies to improve system reliability and reduce sustainment cost

Energy savings will not happen without action. In fiscal year 2016, deep-dive meter data analyses with at least 10 energy managers will be conducted, one from each major Army command. The purpose of these visits is to investigate,

develop, and apply best practices in using MDMS to find energy saving opportunities. Successes and demonstrated best practices will be documented and shared with the MDMS community at large. Energy managers interested in participating in a "deep dive" meter data analysis are invited to send a request to the email address identified in the paragraph below.

Status of all of these initiatives will be reported at least once every two months via an electronic newsletter issued to all MDMS users. It will include news of ongoing program enhancements, training events such as software training webinars, and notices of energy efficiency successes achieved through the MDMS program. To get on the distribution list for these newsletters, send an email request to support@mdms.army.mil.

What remains to be accomplished with the MDMS to achieve the goals of the Army Central Metering Program is relatively small in comparison to the obstacles already overcome – installing advanced meters on buildings that never

had a meter, obtaining cybersecurity accreditations, extending network connectivity to all metered buildings, and establishing meter network sustainment agreements with NETCOM, Assistant Chief of Staff for Installation Management and other MACOMs. The focus is now shifting toward improving MDMS as a tool for energy goal attainment.

Ultimately, success depends upon the involvement of energy managers at all organizational levels within the Army. Stakeholder participation in the continuous improvement of the MDMS is paramount. All Army energy managers are encouraged to take ownership of MDMS. Get involved; communicate your needs; share your ideas.

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Michael Ott is the program manager for the Army's Central Metering Program at the U.S. Army Engineering and Support Center, Huntsville.



Tapping the sun: Building resilience by going solar

by Bonnie Robinson

A high, piercing, metal rat-tat-tat drumming can be heard as giant steel posts are hammered deep into the desert floor of Utah.

Dugway Proving Ground is taking its first step on its way to become more resilient by building a new, environmentally-friendly and renewable solar array. The array will collect the sunlight to provide electricity to the installation's homes, buildings, and test areas of its vast nearly 700,000-acre remote site.

A \$7.7 million solar power array, which began construction this summer near the substation at English Village's housing and administration area, will convert sunlight using solar panels covering 25 acres.

Building resilience means the ability of

an installation – its systems, organizations, workforce, and residents – to adapt to changing conditions.

“Energy security is vital for the Army mission at Dugway,” said Don Smith, Dugway’s new Garrison Manager. “With aging infrastructure of the commercial power grid and frequent power outages it’s critical we look at alternate methods to ensure an uninterrupted power source. Solar power is an excellent way to achieve a degree of energy independence and protect the Army’s mission.”

This is part of a much wider Army goal for environmental sustainability in all its area facilities. The 2007 National Defense Authorization Act requires the Army to consume 25% of electricity requirements



Sean Svendsen, Dugway's resource efficiency manager, examines a solar panel at the solar array construction site, July 30, at U.S. Army Dugway Proving Ground in Utah. The array is a significant part of building the installation's renewable energy plan. Photo by Bonnie Robinson.

from renewable sources by 2025.

“Energy security underwrites our unique ability to rapidly deploy, employ, and ➤

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significant cost savings. This is evident in successful past rate interventions affecting Fort Bragg, North Carolina; Forts Stewart and Benning and Hunter Army Air Field in Georgia; Forts Leavenworth and Riley, Kansas; Fort Polk, Louisiana; Rock Island, Illinois; and others.

HQ IMCOM continues to support CUP with innovative ways to capture cost savings opportunities. This fiscal year 2015 CUP targeted eight garrisons believed to have undiscovered opportunities that could save utility dollars and energy. FY15 garrisons targeted for utilities studies were: West Point, New York; Fort Riley, Kansas; Fort Jackson, South Carolina; Fort Leavenworth, Kansas; Fort Knox, Kentucky; Fort Lee, Virginia; Fort Sill, Oklahoma; and Fort Bliss, Texas.

Completed reports identifying opportunities and recommendations were expected to be released by the end of September 2015. HQ IMCOM and garrisons will begin anew and enhance the program by re-stringing communications in this program.

Garrisons are encouraged to read, take

action and inquire about the opportunities and recommendations the FY15 utilities studies have assessed. Implementation of the methodologies above will establish lines of communication and a tracking record of where external support is required. HQ IMCOM and USACE, subject to availability of funds, will also engage all key stakeholders to provide additional expertise as necessary to support the implementation of more complex opportunities.

Common opportunities utilities assessments have previously identified include:

- Increased participation in demand response program
- Update inventory to capture all reimbursable customers
- Review utilities contract to ensure garrison is on the most favorable rate
- Review invoices to ensure the accuracy of the charges
- High voltage transmission discounts
- Special contracts for high energy users
- Credits (summer charges, peak demand charges, etc.)
- Interruptible rate schedules
- Participation in rate intervention
- Energy efficiency measures to reduce cost and consumption

- Increase capacitance to improve power factor
- Infrastructure improvements
- Install meters where needed

These more common opportunities may easily be executed by the installation with little to no cost. For more complex opportunities, installations are encouraged to contact HQ IMCOM point of contact and/or submit their projects following HQ IMCOM protocol for funding. See Army Regulation 420-1, Chapter 22-12 for energy conservation guidelines.

Remember, timely implementation of recommended opportunities is vital to achieve installation targeted cost savings.

Installation energy managers and utilities sales officers are encouraged to educate and engage all installation personnel to participate. It is everyone's responsibility to take action and lead the way to a better, more sustainable future.

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Evaluating transition, closure options for soil vapor extraction

by David Becker

Soil vapor extraction is one of the most commonly applied and effective cleanup technologies for unsaturated soils contaminated with volatile organic compounds. Though easy to implement, it is often very difficult to assess when the right time is to turn it off or transition to another technology, or to determine the appropriate numerical performance goal for the SVE system. Recent work by the Department of Energy, with expertise contributed by personnel from the U.S. Army Corps of Engineers Environmental and Munitions Center of Expertise and the U.S. Environmental Protection Agency, has offered guidance and a practical tool to answer these questions.

The guidance, titled “SVE Optimization, Transition, and Closure Guidance,” is available for download on the website: http://clu.in.org/techfocus/default.focus/sec/Soil_Vapor_Extraction/cat/Guidance/. The report guides the user through an assessment of the site conceptual model, regulatory considerations, and remaining source characterization approaches, all

leading to a decision logic for transitioning the SVE to other technologies, continuing operation of an optimized SVE system, implementation of enhancements to SVE, or to SVE system closure. Appendices to the guidance provide 1) details on

Acronyms and Abbreviations	
SESOIL	Seasonal Soil Compartment Model
SVE	Soil Vapor Extraction
SVEET	SVE End-state Tool
USACE	U.S. Army Corps of Engineers

The screenshot shows the SVEET tool interface. On the left is a spreadsheet with columns for parameters (A-L) and values for three cases (Case A, Case B, Case C). The spreadsheet is divided into sections: User Input, Calculated Input, and Result. On the right is a 3D diagram of a subsurface cross-section showing a source, vadose zone, groundwater table, and a compliance well. Parameters like L1, L2, w, d, and q are labeled in the diagram.

Parameter	Permissible Range	Key Values
T	10 - 30	20
ω	1 - 9 ⁺	1.5, 9 ⁺
R	0.4 - 7.5 ⁺	0.4
VZT	10 - 60	10, 30, 60
L1	varies ⁺	—
z	varies ⁺	—
w	10 - 50 ⁺	—
q	0.005 - 0.3	0.005, 0.03, 0.3
d	10', 25', 50', 75', 100'	10, 25, 50, 75, 100
s	5 - 30	5
C _{gs}	1 - 2000	159
M _{src}	0.1 - 5000	1

Screen shot of input screen for SVEET tool.

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sustain military forces around the globe,” said Katherine Hammack, Assistant Secretary of the Army for Installations, Energy and Environment in a press release. “It’s for that reason the Army is moving toward building resilience into our installations.”

The array’s 2-megawatt solar photovoltaic cells will generate about 3,990 megawatt-hours of power annually, enough to power more than 500 homes according to the Corps of Engineers.

The array includes 1,300 enormous metal posts that require large pile drivers to pound them deep into the soil to ensure stability. They hold the 3,300 stationary solar panels that are being attached. The panels are estimated to last for 30-plus years.

Sean Svendsen, Dugway’s Resource Efficiency Manager, said that solar is a significant part of building the

installation’s renewable energy plan. Once operational, the array is expected to generate about 10 percent of the electricity needs, or about 4.5 percent of the total installation energy.

“It will help us provide cleaner, more affordable energy and provide substantial cost savings for the installation, which will save Dugway about \$640,000 a year, or about \$12 million over 25 years,” Svendsen said.

Approximately 400 acres have been approved for solar development on the installation, including English Village (325 acres total) and the Ditto area (75 acres).

“A second solar 2-megawatt array near the test center will strengthen our energy security posture,” Smith said.

In addition to solar-generated electricity, Svendsen noted Dugway is working on a number of energy projects, including wind and geothermal energy, which would combine heat and airstream power to support cost for additional energy security

measures.

“The installation is also considering a microgrid control system to combine various energy resources to form an integrated system,” he said.

TriEco-Tetra Tech Sustainable Resources Joint Venture of San Diego was awarded the contract by the U.S. Army Corps of Engineers, Sacramento District. Hunt Electrical of Salt Lake City is also part of the construction team.

Dugway Proving Ground’s primary mission is to test chemical and biological defenses, such as detectors, protective clothing, and decontamination equipment. Dugway is part of the Army Test & Evaluation Command.

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methods to quantifying remaining source mass and 2) an approach to estimating impacts of the remaining mass on ground water (or to assess what cleanup levels must be achieved in soil above the water table to protect ground water from an impact above a certain concentration).

A companion Microsoft Excel® spreadsheet tool, SVE End-state Tool, has been prepared to assist the user in estimating the ground water impacts from remaining sources and is available at the same website provided above. The spreadsheet is essentially a model code that simulates the leaching of contaminant mass through infiltration and vapor transport. Although other tools exist, such as VLEACH and the Seasonal Soil Compartment Model, these only consider one-dimensional (downward) transport. The SVEET tool considers the lateral vapor diffusion, as well as the mixing of the mass loading from the vadose zone




Typical SVE site. Photo by David Becker.

into the water table. The spreadsheet does not perform complex calculations, as it consists largely of look-up tables that were populated by results of running a much more sophisticated multiphase model on a supercomputer for a range of each of many input variables.

The spreadsheet tool is extremely easy to use and requires the user to enter depth and dimensions of the remaining source area, the depth to water, contaminant name, average infiltration, ground temperatures, ground water velocity, and location and screen length of a downgradient compliance well. The user can enter an observed soil gas concentration or estimated mass discharge from the source area. The spreadsheet computes the water concentration at the compliance well. If the user desires an estimate of the necessary remediation goal for soil to achieve a concentration at the compliance well, the model can be run with different soil gas concentrations or mass discharge values until the model shows attainment of the goal at the compliance point.

Overall, the guidance tool should be very useful to Army personnel and their contractors in assessing the closure strategy for SVE systems. The use of the guidance should help reduce future costs to the Army, reduce environmental footprints of Army cleanups, and facilitate acceptance of actions that will potentially yield faster site closure.

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David Becker is a geologist with the U.S. Army Corps of Engineers Engineering and Support Center, Huntsville Environmental and Munitions Center of Expertise in Omaha, Nebraska. 



The Fort Carson, Colorado, expansion of the installation's reclaimed water system to irrigate Iron Horse Park and sports fields is anticipated to save close to 90 percent of the annual irrigation water costs instead of using drinking water. The project includes expanding the Cheyenne Shadows Golf Course holding pond to hold up to 16 million gallons of water for use during watering season. Ultimately, the desired outcome of the reclaimed water system expansion effort is to use 100 percent, roughly 200 million gallons, of Fort Carson's treated waste water for irrigation of priority turf areas during the watering season, which will eventually include Founders Field, Pershing Field, and Gate 1. Fort Carson's energy and water conservation efforts earned the installation its fourth Federal Energy and Water Management Award and third Secretary of the Army Energy and Water Management Award. Courtesy photo.



Fort Bragg turns to composting to tackle food waste

by Audrey Oxendine

Diversion of food waste is one of the newest trends in recycling. Recent waste characterization studies at Fort Bragg, North Carolina, show 24 percent of all waste disposed on the installation is organic. Specifically at the dining facilities, 49 percent of waste disposed is organic. Fort Bragg is using two new technologies to divert food waste from landfills.

The first is an in-vessel composting system manufactured by Engineered Compost Systems. Composting is not a new technology. However, the systems available to manage compost are continually evolving.

For years, Fort Bragg did not have the manpower, equipment, or nitrogen source available to compost. Traditional windrow systems must be turned for aeration, moisture added, and temperatures monitored every day. Through a networking seminar at WASTECON in 2009, Fort Bragg was made aware of a new, unused composting system at Naval Air Station Patuxent River in Maryland. It took several years to actually acquire the system, move it to Fort Bragg, and set up

the operation.

The Qualified Recycling Program operates the system under a North Carolina Type 3 Composting (Demonstration) Permit. Food waste is collected Monday through Friday from the commissaries and is hauled to the composting facility at the Lamont Landfill.

Since December 2014, 93.8 tons of food waste have been composted. The new system greatly reduces the manpower required to compost since aeration and temperature monitoring are automated. The feed stocks used for composting are food waste and wood chips. These are mixed in an auger and fed by conveyor belt to the 40-yard steel vessel. The vessel is then connected to the system fans and temperature probes are inserted. The probes monitor the temperature on a routine basis and log the data.

Regulations require each vessel maintain a temperature greater than or equal to 104 degrees Fahrenheit for 14 days with an average temperature above 113 degrees F for that regime. Temperatures must be greater than or equal to 131 degrees

Acronyms and Abbreviations	
BOD	Biological Oxygen Demand
F	Fahrenheit
LFC	Liquid Food Composter

F for three consecutive days to achieve further pathogen reduction. Process times are approximately 30 days on average per vessel. Another 30–60 days is allowed for curing the final product.

Overall, the system works well. There were some growing pains such as finding the right mix of feedstock and moisture; however, the final project is now considered Grade A compost.

The second system is a liquid food composter, the LFC-200, manufactured by Powerknot. Fort Bragg was approached by company representatives in hopes of purchasing their equipment. Many installations had tried similar systems for food waste disposal, but the discharge waste water was very high for biological oxygen demand. Powerknot data indicated the BOD from their equipment was between 100 – 300 mg/L.

Fort Bragg’s sanitary sewer system is privatized with a sewer use ordinance that requires discharges to be less than 250 mg/L for BOD. Because of the regulatory requirement, we agreed to test the equipment for a period of time to evaluate its performance. The system uses microbes and enzymes to break down food into liquid waste that can be discharged through the sanitary sewer.

We decided to test the LFC-200 that processes 800 pounds of food waste per day. It was installed in the kitchen of the dining facility. All pre-consumer food, with the exception of a few items like bones and corn husks, are added to the unit daily. The unit tracks the weight added and continuously adjusts. A multitude of options on the touch screen allows the user to track food waste and carbon diverted.



An employee mixes and loads feed stocks into the composting vessel. Photo by Audrey Oxendine.



Military Munitions Response Program cleaning up waste

by Macrina Xavier and Denee Cremeans

When we think of waste, we hardly consider the situation of munitions, explosives, or ordnance. However, the research, development, testing of, and subsequent training on military munitions over the past 150 years within the Department of Defense have led to significant allocation of efforts for handling munitions waste. The DOD, through the Military Munitions Response Program, addresses discarded military munitions, munitions debris, unexploded ordnance, and munitions constituents.

The most important regulation affecting munitions waste is the Environmental Protection Agency's munitions rule issued in 1997 that defines the criteria where



Unfired M107 155-mm projectile, with lifting lug intact, found under an existing parking lot.
Photo by M. West.

unused, used, and fired military munitions are determined to be solid or hazardous waste. As a result of its ever changing arsenal, the Army, including Fort Belvoir, Virginia, is in the process of identifying former munitions training, testing, and disposal sites in order to conduct cleanup operations in dealing with munitions waste.

The Fort Belvoir North Area, formerly known as Engineer Proving Ground, an 800-acre non-contiguous property of the Fort Belvoir Army installation, was acquired in the 1940s and established during World War II for testing engineering equipment and supplies. Testing activities and equipment on FBNA's 10 ranges included, but was not limited to, the research and development of deployment, detection, and neutralization techniques of landmines, anti-intrusion, and counter barrier systems and techniques; and heavy equipment testing and training. As a result of the extensive research and development activities for landmine warfare that occurred at FBNA, the entire FBNA property is considered a munitions response area under the MMRP.

Fort Belvoir's Main Post, located southeast of FBNA, began as an engineering school, ordnance range and training camp for soldiers entering World War I. In 1922, the installation became a permanent Army installation and was used

Acronyms and Abbreviations	
DOD	Department of Defense
FBNA	Fort Belvoir North Area
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
UXO	Unexploded Ordnance

primarily for training military engineers. During World War II, the mission at the Main Post was to train officers and soldiers participating in efforts across Europe and Southeast Asia. Following World War II, Fort Belvoir's engineer school continued operations until 1989 after which time it was transferred to Fort Leonard Wood, Missouri.

As is the case with most installations, ordnance waste is discovered at unexpected sites often through construction activities, as well as known sites where ordnance waste may be expected. At FBNA, which recently underwent a massive redevelopment project, hundreds of foreign landmines brought back after World War II, rockets, mortars, and demolition materials were found in various disposal pits within the expected former range areas. In addition, six emplaced landmines were found during a UXO clearance outside of a known range area at one proposed construction site, which entailed an extensive munitions and explosives of concern clearance of up to two feet below ground surface. The six emplaced landmines were determined to contain energetic materials and were disposed of in accordance with Virginia waste regulations.

Other items found in non-range areas include a 250-pound buried bomb, which was determined to be safe and disposed of as scrap under Resource Conservation and Recovery Act regulations, as well as a 155-mm projectile located under an existing parking lot which was being retrofitted for an underground stormwater detention facility.

The often inevitable concern that accompanies munitions waste, apart from the potential for explosive hazards, is the impact to the ecology and the

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This unit has been in operation since November 2014. So far, 7.4 tons of food waste have been disposed. There are some recurring maintenance requirements. Power chips must be replaced every three years. Power enzymes must be replaced every six months. However, the utility and maintenance costs are less than landfill disposal cost.

One of the biggest benefits to the staff is the LFC limits the amount of waste that must be transported out to

the dumpsters for landfill disposal. For the installation, depending on the refuse contract structure, it reduces landfill disposal costs. Recent waste water analysis for BOD indicated the level at 18.6 mg/L. We are continuing to monitor the BOD levels and hope to eventually install a unit at all dining facilities.

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Program helps installations with fuel operations, repairs

by Jesus Ramirez

In 1980 the Defense Logistics Agency approached the U.S. Army Corps of Engineers, Engineering and Support Center, Huntsville to award contracts for the creation of Operations and Maintenance manuals for its Defense Fuel Supply Center. The DLA-Fuels Recurring Maintenance and Minor Repairs Program initially rolled out for Army installations in Europe in 2001. Based on that success, DLA Energy asked Huntsville Center to develop a continental United States program to provide program management

and contracting support in 2009.

DLA-Fuels, administered by Huntsville Center provides vital maintenance inspections, repairs, and emergency response actions for DLA capitalized petroleum facilities at Army and Installation Management Command installations worldwide in compliance with federal, state, and local code, criteria, and regulations. In addition to the Army, the DLA-Fuels Program supports Navy and Air Force service components.

The DLA-Fuels Program provides

Acronyms and Abbreviations	
DLA	Defense Logistics Agency
DLA-Fuels	Defense Logistic Agency Recurring Maintenance and Minor Repairs Program
QAE	Quality Assurance Evaluator
USACE	U.S. Army Corps of Engineers

maintenance support to more than 225 installations to assist fuel managers, Directorates of Public Works and Defense Logistics Organizations maintaining the DLA capitalized investment of fuel facilities while assisting in extending their usable life.

DLA-Fuels Program is divided into two major areas: Recurring Maintenance and Minor Repair. Recurring maintenance contractors provide maintenance inspections typically at a quarterly, semiannual, and annual basis, identifying possible deficiencies that can contribute to the deterioration on the fuel system affecting the site operation. These visits generate a deficiency list. Recurring Maintenance is the backbone of this program and focuses on maintaining the capital investment. Minor Repair (Service Orders) is used to repair deficiencies identified during the recurring maintenance visit using the service order procedure, initiated by the Quality Assurance Evaluator. The QAE is a government



Before and after photos of a fuel storage tank repaired by the DLA-Fuels Program. Photos by Arrick Price.

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environment. Unacceptable risks from releases of munitions constituents in soil, water, and sediment are present at many sites at known range areas that impact wetlands, wildlife habitats, residents, and workers. Fort Belvoir has coordinated with state and federal regulators in cleanup efforts of munitions and related waste. Currently several munitions response sites are undergoing investigations to determine the nature and extent of the risks to human health

and the environment. To date, Fort Belvoir has spent more than \$15 million to clean up munitions waste and related releases of munitions constituents. The fiscal year 2016 requirements for munitions response efforts include costs for actions that include focused MEC clearance, ecological risk assessment, feasibility studies, remedial investigations, community engagements, and active UXO support during intrusive activities.

Managing significant munitions waste – as is the case at many Army installations – is an enormous obligation for the Army

which has committed financial resources well into the future.

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Utilities Privatization Program: Program helps Army sell utility infrastructure to private entities

by Steve Tallman

Utilities Privatization is the tool the Army is using to sell government-owned, on-post utilities infrastructure to private entities. The contractor acquiring these systems will own the infrastructure and will be responsible for its operation, maintenance, repair, and replacement. The Army does not retain ownership of the systems nor will it contract out O&M of the systems to private entities. The systems are sold outright to a private owner-operator.

In 10 U.S.C. 2688, utilities are defined as electric, water, wastewater, natural gas, steam, hot and chilled water, and telecommunications distribution systems. The Army is focusing on electric, water, wastewater, and natural gas systems, basically the infrastructure that connects

the installation to the off-post commodity supplier. Generally this does not include the wiring and piping inside buildings or the utility commodities proper.

UP is being used throughout the Army to leverage private sector resources to revitalize aged and deteriorated utilities systems because, as the Deputy Secretary of Defense has stated in a memorandum dated Oct. 9, 2002, "Historically, military installations have been unable to upgrade and maintain reliable utility systems fully due to inadequate funding and competing installation management priorities. Utilities privatization is the preferred method for improving utility systems and services by allowing military installations to benefit from private sector financing and efficiencies."

Acronyms and Abbreviations	
CIP	Capital Improvement Projects
FAR	Federal Acquisition Regulation
ICU	Initial Capital Upgrade
HQ	Headquarters
IMCOM	Installation Management Command
O&M	Operations and Maintenance
OPORD	Operations Order
OACSIM	Office of the Assistant Chief of Staff for Installation Management
R&R	Renewals and Replacements
UP	Utilities Privatization

The Army has been taking advantage of the benefits of Utilities Privatization since the late 1990s when 10 U.S.C. 2688 ➤

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representative who validates that the government has a valid requirement and manages the service order priorities requested of the Recurring Maintenance/Minor Repair contractor. Service order is either routine or emergency. Minor Repair sustains equipment operational readiness.

Three of the major keys to success for the DLA-Fuels Program are: 1) This contract allows installation fuel operators the ability to customize their recurring maintenance frequency and allows a single contract vehicle to be used for repairs and maintenance. Previously, each site would need to spend time and effort for single contracts to repair a valve or pump; 2) The ability to address emergency minor repair issues in a timely manner, via the use of service orders. The DLA-Fuels Program executes 24-hour worldwide support for emergency situations involving DLA capitalized fuel equipment/facilities. This service provides essential assistance to sites that have critical situations, often

affecting the mission; and 3) Using expert fuel contractors that are evaluated based on their past performance in the field of petroleum fuel systems and minor repairs but also in complying with federal and local regulations.

An example of the type of fuels support provided occurred recently at Fort Hood, Texas. A vehicle hit a fuel dispenser, causing damages to it. The QAE requested an emergency service order to assess/survey the damages and complete the required repairs. The contractor responded within 24 hours and completed the assessment, cut and capped electrical and fuel lines, installed a new dispenser, and returned the fuel dispenser to its normal operation.

"The recurring maintenance contract provided by DLA-Energy has been a great asset to the DLA mission here at Fort Hood," said Arrick Price, the Fort Hood QAE. "The recurring maintenance contractor has responded to the needs of this facility with a great sense of urgency – in most cases after explaining the problem that we are having, the contractor shows up with the right parts to not only diagnose the problem, but fix it while on-site."

DLA-Fuels Program is an effective recurring maintenance and minor repair program that increases the reliability and safety of facilities, system, and components. This increases the useful life of facilities and equipment resulting in optimizing the life cycle of the fuel system and components, thereby increasing the duration between required re-capitalized investments. DLA-Fuels Program maintains a close working relationship with DLA-Energy, the Service Control Points (Army Petroleum Center, Navy Support Center, and Air Force Petroleum Agency), and the installation points of contact, as well as with the USACE Omaha District Petroleum, Oil and Lubricants Center of Expertise. This coordination is critical to solve daily issues for the fuel operators. It also is critical for coordination and execution.

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first authorized UP conveyance with up to 50-year utility service contracts when it has been determined to be cost effective to do so. The UP process removes the Army from the business of owning, managing and operating utilities to allow it to focus on core defense missions and functions.

Before privatization, all O&M, R&R, and recapitalization requirements for government-owned systems are programmed and funded through facility Sustainment, Restoration and Modernization programs. Generally it takes about two years to award an UP contract, during which time the Army prepares an inventory of the infrastructure, notes deficiencies and an initial capital upgrade project, the contractor submits a bid which is then evaluated and negotiated by government teams. If the contractor is successful, the assets are transferred and the post-award period begins. If the venture is not determined to be cost effective, then the system is not privatized.


During the post-award phase, UP contracts are administered by the Defense Logistics Agency. The contractor assumes O&M and implements ICU projects as well as renewals and replacements, i.e., the ongoing maintenance, repairs, and upgrades that permit safe and reliable operations of the system. After privatization, all O&M, R&R, and recapitalization requirements are provided by the privatization contractor and programmed for the first three years by Headquarters, Installation Management Command, and Office of the Assistant Chief of Staff for Installation Management as utility requirements through Base Operations Support funding. Thereafter, the garrisons assume responsibility to program for O&M, R&R, and capital improvement projects. HQ IMCOM continues to centrally manage resources and validates CIP projects. Rate redeterminations then recur on an interval of approximately every three years.

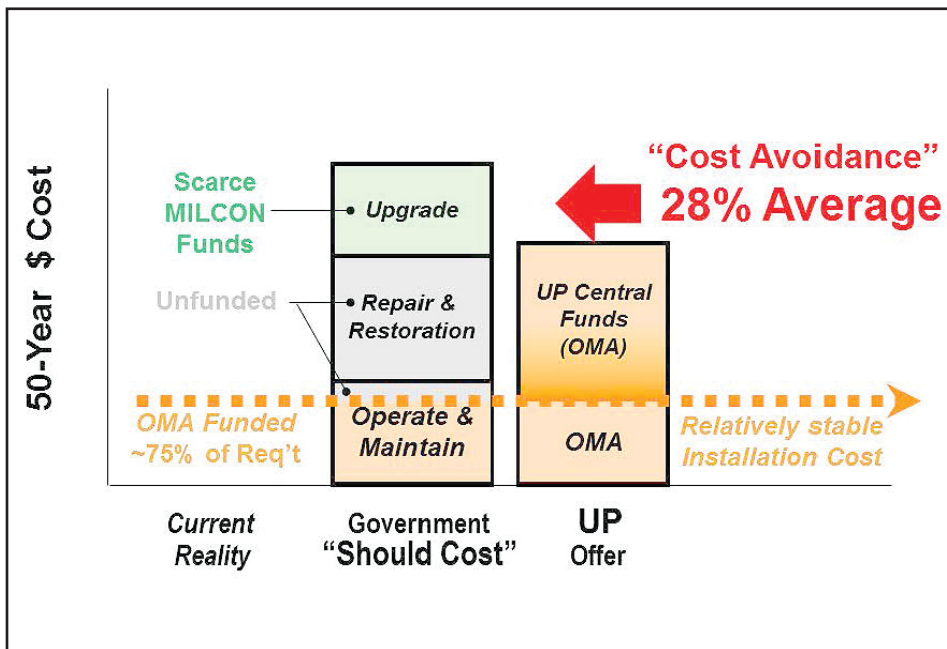
It should be noted that UP is a Utility Service Contract [FAR Part 41] and is NOT a Construction Contract [FAR Part

35], nor is it a Services Contract [FAR Part 37], thus the authorities granted to it enable certain capital costs to be embedded in the rate that the UP provider charges the Army for its services. As more utility systems are privatized and contracts are awarded each year, the post-award contract administration workload continues to grow. Post-award contract administration for utilities privatization contracts is arguably the biggest utilities privatization issue for the Army today. A utilities privatization contract is very workload intensive and complex due to the privatization and ownership features. There are a number of legacy UP contracts under the administration of the Mission Installation Contracting Command, while the Army's exclusive agent for all new UP contracts is Defense Logistics Agency. Currently C.H. Guernsey provides technical support and regulatory rate analysis for pre- and post-award UP.

HQ IMCOM validates the UP funding requirements in support of programming efforts for the Program Object Memorandum every year through the Operations Order process. For fiscal year 2016, an additional annex to this OPORD will provide business rules and criteria for garrison submittal of CIP projects. The new business rules will reflect criteria similar to those developed for the annual QUTM energy and utilities project call as well as procedures that will be included in a pending OACSIM memorandum on infrastructure additions to privatized utility systems. The UP OPORD is expected to be issued in the first quarter of fiscal year 2016, and input will be due around mid-December.

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The Utilities Privatization decision is based on a model for FULL sustainment, known as "Should Cost." In this way, UP is designed for success. Illustration courtesy of OACSIM.



2015 sustainability awardees making impact across USACE

by Clare Palo

The U.S. Army Corps of Engineers is honored to once again present this year's Sustainability Awards to individuals and teams who are working toward a more sustainable future.

The award winners come from across USACE, reflecting a diverse group of individuals and teams who are committed to sustainability and ensuring that the agency's Environmental Operating Principles are put into practice every day.

"The commitment to sustainability by these exceptional Corps of Engineers employees makes us all proud," said Maj. Gen. Richard Stevens, the Deputy Chief of Engineers. "This year's USACE Sustainability Award winners are champions in a noble endeavor to increase environmental quality, enhance the mission

and become more sustainable. They personify our command's commitment to the Environmental Operating Principles that are making the world a better place."

The following 2015 Chief of Engineers Awards of Excellence Sustainability Category winners will be recognized during a video teleconference ceremony in October:

Sustainability Hero: Mike Ternak, Sustainable Engineering Program Manager, South Pacific Division

Green Dream Team: U.S. Army Engineering and Support Center, Huntsville, Energy Savings Performance Contracting Team

Green Innovation: Europe District's Net Zero Planning Team

Acronyms and Abbreviations	
DOD	Department of Defense
DOE	Department of Energy
ESPC	Energy Savings Performance Contracting
FEMP	Federal Energy Management Program
GSA	Government Services Administration
LEED	Leadership in Energy and Environmental Design
MOU	Memorandum of Understanding
USACE	U.S. Army Corps of Engineers

Good Neighbor: San Francisco District's Solar Project at Lake Sonoma Team

Lean, Clean and Green: Detroit District's Flex Fuel Program

Building the Future: Sacramento District's Presidio of Monterey General Instruction Building

All award winners have been sent forward for consideration in the 2015 Presidential GreenGov awards program.

Sustainability Hero: Ternak has successfully created innovative sustainability practices and improved management approaches throughout his many years with the Corps of Engineers. He was the lead planner and project manager for two of the nation's first large scale river ecosystem restoration projects: The Rio Salado Project and the Tres Rio Projects, which received recognition as the USACE Chief of Engineers Design and Environmental Awards of Excellence in 2008 and 2012. As the South Pacific Division Sustainable Engineering Program manager, he has helped the division increase the number of employee Leadership in Energy and Environmental Design accreditations from 12 in 2009 to 65. Additionally, the division has produced 45 LEED-certified buildings for federal customers through his management. Not only does he strive to improve sustainability practices, he encourages and helps colleagues with leadership management through training courses and webinars, as well as mentoring interns. In his selfless effort to improve ➤



The inner courtyard of the new general instruction building for the Defense Language Institute Foreign Language Center at the Presidio of Monterey, California. The courtyard sits on the roof of the second floor which allows all interior facing rooms to receive sunlight through windows that reduce the use of interior lighting and electricity. The courtyard also features multiple skylights to provide natural lighting to the assembly hall below. All rainwater that lands on the facility is collected in large underground cisterns and will provide nonpotable water for toilet-flushing and irrigation needs. The institute is one of several major construction projects at the Presidio managed by the U.S. Army Corps of Engineers Sacramento District. The program incorporates the latest energy and water conservation technologies in order to operate more efficiently and in a sustainable, environmentally friendly manner. Photo by Capt. Michael N. Meyer.



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our environment, he continues to design a work community that appreciates sustainability as much as he does.

Green Dream Team: The Huntsville Center's ESPC team has been recognized by the Assistant Secretary of the Army for Installations, Energy and Environment, Office of the Secretary of Defense, and the White House Council on Environmental Quality for its expertise in third party acquisition, acquisition processes, project execution, and quality. In 2014, the Huntsville Center team began the process to initiate a strategic partnership with the Department of Energy Federal Energy Management Program that resulted in a Memorandum of Understanding between Headquarters, USACE, and the DOE FEMP. The MOU establishes a framework for partnership and collaboration, leverages the strengths of both agencies, enables better support to federal agencies in meeting the President's Performance Contracting Challenge goal, and has spawned a strategic relationship for the Huntsville Center with the U.S. Air Force. This strategic partnership with DOE FEMP is being viewed by other services, federal agencies, and the industry as the

way forward for success in meeting the federal and Department of Defense energy and water reduction, renewable energy, and Net Zero mandates.

Green Innovation: Phillip Cohen, chief of Europe District's planning section, and Rich Gifaldi, the district's Sustainable Engineering Program manager, combined efforts to form the Europe District Net Zero Installation Planning team that developed a cutting edge holistic approach to Net Zero Installation Planning, which is transferrable to DOD installations worldwide. The approach combines two offices within the district, Master Planning and Engineering, to create a strategic roadmap that other installations can use to plan and track their progress toward Net Zero, resulting in saving energy and water in building and using smart land development. The combined approach identified energy conservation opportunities, renewable energy practices, and sought to increase public energy awareness. The efforts of these two innovative and creative strategists provided a fresh approach toward the efforts of water and waste goals. Their partnership efforts made a significant impact and positive improvements for customers in Europe.

Good Neighbor: A new solar and



Mike Ternak, Sustainability Hero

wind power plant on tribal lands that will provide sustainable energy for both the USACE San Francisco District and the Dry Creek Rancheria Band of Pomo Indians is being developed by the two entities. The Pomo Indians will install the plant at their cost and then sell green power to the San Francisco District for use at the Lake Sonoma fish hatchery as well as a visitor center and other nearby buildings. The joint projects were developed through the relationships built by Mike Dillabough, San Francisco District's Chief of Operations, and Harvey Hopkins, the Chairman of the Dry Creek Rancheria Band of Pomo Indians. In November 2014 the two entities signed a 25-year agreement to develop and operate a sustainable renewable energy production plant. The solar project will help bring the Corps of Engineers closer to meeting the Army's goal of deriving 25 percent of its energy from renewable sources by 2025. The combined effort shows an "exemplary cooperation" between a federal agency and a local community on energy conservation. This project serves as an ideal partnership goal, which all Corps of Engineers ➤



U.S. Army Engineering and Support Center, Huntsville's Energy Savings Performance Contracting team, represented by Jason Bray, Lisa Harris, Rob Mackey, Priya Desai-Stiller, and Wesley Malone. Photo illustration by Amy Newcomb.



Planning for energy, water, waste at Reserve Forces Training Area

by Cyndi Skinner, Barry Gordon and Gabe Cross

In early 2010 Parks Reserve Forces Training Area, in Dublin, California, was identified as one of the Army's Net Zero pilot installations for Net Zero energy capability by 2020. A lot has happened in the last five years that has helped Parks RFTA move toward its Net Zero energy goals, as well as complementary goals for water, waste, and stormwater. The current Unified Facilities Criteria 2-100-01 Installation Master Planning, released in 2012, was the first major update of the UFC in over 25 years; for the first time ever it is focused on sustainable strategies for planning. The UFC is more than a regulation; it marks a fundamental change in the way the Department of Defense approaches master planning. It establishes a worldwide planning program that includes guiding policy, education, training, and metrics. This wholesale change in installation master planning is not only a return to plan-based programming, it also embeds sustainability into its core tenets.

The release of the UFC was followed closely by new public law that supported

Parks RFTA's energy, waste, water, and stormwater goals. The 2013 National Defense Authorization Act requires that installations update their master plans at least every 10 years and address environmental and sustainability planning as part of the update. The 2014 NDAA gave more specific direction that calls for:

- a. compact and infill development;
- b. horizontal and vertical mixed-use development;
- c. full lifecycle costs of planning decisions; and
- d. capacity planning through the establishment of growth boundaries...while focusing development toward the core.

The 2014 NDAA also states that “[a] master plan for a major military installation shall be designed to (use) multi-story, mixed-use facility solutions that are sited in walkable complexes so as to avoid, when reasonable, single-purpose, inflexible facilities that are sited in a sprawling manner.”

Acronyms and Abbreviations	
ADP	Area Development Plan
ERDC-CERL	Engineer Research and Development Center-Construction Engineering Research Laboratory
EUI	Energy Use Intensity
EO	Executive Order
NDAA	National Defense Authorization Act
NZP	Net Zero Planner
RFTA	Reserve Forces Training Area
SCP	Sustainability Component Plan
UFC	Unified Facilities Criteria
USAC	U.S. Army Corps of Engineers

All of this momentum has helped support Parks RFTA in meeting the goals of creating a UFC compliant Master Plan four years ahead of the Oct. 1, 2018, deadline outlined in the Office of the Under Secretary of Defense – Acquisitions, Technology and Logistics’ Policy Memorandum (2 Dec 2013). The Parks RFTA Master Plan also

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partnership efforts should aim to emulate.

Lean, Clean and Green: Detroit District’s deputy commander and Logistics staff strived to find the best and brightest team members to develop a program to encourage the district’s workforce to use flex fuel in its flex fuel Government Services Administration vehicle fleet. The missions included reducing gasoline consumption by 30 percent, while also increasing GSA fleet use to save on temporary duty costs. The team members sought to educate operators on fuel use by providing fuel maps and logbooks to help them closely monitor their flex fuel usage. Their hard work paid off. The Detroit District went from using 2 percent of E-85 in its flex fuel fleet to a usage of more than

71 percent within the first eight months of implementing the education efforts. In addition, the demand for gasoline decreased from 40,000 gallons in fiscal year 2013 to a little more than 32,000 gallons in 2014, a 20 percent reduction while still executing the same mission. The Detroit District team continues to remind workers that a cleaner and safer environment is needed, especially when it comes to reducing carbon in our atmosphere.

Building the Future: Sacramento District was commissioned to do a job that involved love for sustainability practices as well as a love for the natural environment. The Defense Language Institute at the Presidio of Monterey, California, asked the district for a modern instruction building to not only improve its campus but also be environmentally friendly. Sacramento District’s list of improvements to make the campus more environmentally practical

included using natural light, recycled rainwater for toilets, and modern sustainable practices. The team created a safe, sustainable, and simple new building for students, which serves as an “optimum learning environment” for creativity. The building was constructed to meet LEED Silver certification. The collaboration and tireless efforts of the Sacramento District created a top-notch, environmentally friendly building that can help enhance the learning of the students at the Defense Language Institute and will help the Presidio meet its goal of being Net Zero energy by 2030.

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conforms to the latest executive order on the subject. In March 2015, the White House published EO 13693, “Planning for Federal Sustainability in the next Decade,” stating, “...agencies shall increase efficiency and improve their environmental performance. Improved environmental performance will help us protect our planet for future generations and save taxpayer dollars through avoided energy costs and increased efficiency, while also making Federal facilities more resilient. To improve environmental performance and Federal sustainability, priority should first be placed on reducing energy use and cost, then on finding renewable or alternative energy

solutions.”

EO 13693 supersedes previous EOs and has set the bar higher by creating stringent guidelines and goals, to include:

- Reduce Green House Gas emissions 40 percent by 2025 ('08 baseline)
- Reduce Energy Use Intensity 2.5 percent annually by 2025 ('15 baseline)
- At least 10 percent of building energy use is “clean” by 2025 (renewable and alternative)
- Reduce Water Use Intensity 36 percent by 2025, 2 percent annually ('07 baseline)
- By 2020, new construction of federal buildings over 5,000 square feet are to be designed to be Net

Zero energy and strive for Net Zero water and waste by 2030

- In 2016, identify 15 percent (by sf) of agency building inventory that will comply with Federal High Performance Sustainable Buildings guiding principles by 2025
- Each agency will prepare for impacts of climate change on mission critical water, energy, communication, transportation, and operations

Parks RFTA is well on its way to meeting these requirements through the development of an installation Sustainability Component Plan. Based on the Installation’s completed master plan, the SCP is a detailed analysis of each district’s path to meeting or exceeding federal sustainability goals and mandates, and includes a comprehensive plan for addressing each district’s energy use, water use, waste management, and stormwater management. SCPs include a comprehensive Energy Plan, Water Plan, Waste Plan, and Stormwater Plan, as well as a comprehensive list of strategies and policies, and an explanation of the metrics and calculations used to arrive at the final plan. The SCP covers two districts at Parks and it unfolded in three phases – preparation, analysis, and strategy application.

SCP Preparation. Leading up to the workshop, interdisciplinary teams that included installation personnel collected data for all buildings on the installation, including envelope assemblies, environmental control systems, lighting, and equipment with significant effects on the building’s energy load. This data, along with the completed ADPs and GIS shapefiles, was sent to the Engineer Research and Development Center-Construction Engineering Research Laboratory, developers of the Net Zero Planner tool and trained staff from the Fort Worth District, U.S. Army Corps of Engineers, for input into the NZP tool to generate a baseline energy-use



Participants worked in an applied instructional environment and learned how to model Energy Use Intensity by using the completed Area Development Plans as a starting point to apply sustainability strategies. Courtesy photo.



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model for the entire area, optimize energy efficiency measures, and set targets for future development.

SCP Analysis. In early 2014, roughly 30 people, including senior leadership, Directorate of Public Works staff and other installation stakeholders gathered to start the SCP. The workshop was led by USACE and supported by ERDC-CERL. Participants received a theoretical overview of mandates, strategies and their applications, and instruction on how to integrate sustainability into the Master Plan. Participants worked in an applied instructional environment and learned how to analyze the completed ADPs. Additionally, the participants collected information on the existing condition to include the district's climate and context, current consumption patterns, and sustainability efforts to date including successes and lessons learned. This analysis was then used to support the determined baseline for energy and water consumption, waste generation, and stormwater runoff. Ancillary goals were set and all progress was then measured in reference to this baseline.

SCP Strategy Application. Meeting sustainability goals required design efforts to be integrated with cultural change and individual efforts to reduce the environmental impacts at Parks RFTA. Informed by the analysis, sustainability vision statements with specific measurable goals and target strategies were developed for each of the four major categories. This holistic approach employs a planning-level assessment of buildings; performs energy, water, and solid waste calculations; and establishes base, better, and best models for energy, water, waste and stormwater using the Army's goal of Net Zero as the framework.

Energy Plan. The Energy Plan graphically displays buildings based on their Energy Use Intensity and shows how

strategies to reduce consumption improve building EUIs by meeting the Parks RFTA Vision for Energy Use: Achieve Net Zero energy and self-sufficiency through passive load reduction, optimized energy efficiency and recovery, and meet reduced loads with on-site generation and storage. The vision and embedded goals are supported by implementable and site specific sustainability strategies. As an example, Goal 1: Passive load reduction is supported by the following strategies: narrow wings, thermal mass, reduced infiltration, increased insulation, direct solar gain, high performance windows, natural ventilation and night flushing, and daylighting. It is by embedding the strategies within the goals that the Net Zero vision can be achieved comprehensively on the district and installation scale for the short-term, long-term and capacity plan on a base case, better case and best case. Parks RFTA's total reduction for the short-term, long-term and capacity plan are 25 percent, 62 percent, and 100 percent reduction in energy use from the base to best case models, meeting the Army's Net Zero Energy Installation goal. This equates to a savings of 6.2 million kwh of energy per year; 100 percent of remaining demand met with on-site photovoltaic panels.

Water Plan. The Water Plan displays which buildings are appropriate for specific water reduction strategies and is used to identify district scale water strategies, infrastructure projects, or opportunities for large water savings that are not connected to individual buildings. By implementing the identified strategies, Parks RFTA is able to forecast a 51 percent reduction of water use even with full build out of the Master Plan. This results in a savings of 29 million gallons of water per year.

Waste Plan. The Waste Plan displays buildings based on the application of waste strategies and identifies projects that relate to waste generation or diversion. Buildings slated for demolition, existing or proposed waste management facilities (including

reuse centers or composting facilities), or other waste management projects are displayed as appropriate. Parks RFTA is able to forecast a 57 percent reduction of solid waste generation. This is a reduction of 2.8 million pounds per year.

Stormwater Plan. The Stormwater Plan displays all impervious surfaces that will generate runoff in excess of natural site hydrology and the location of all strategies used to mitigate that runoff. Building level strategies such as rainwater harvesting or green roofs as well as district scale strategies such as engineered biofiltration features are displayed as appropriate. Parks RFTA is able to mitigate 100 percent of its stormwater runoff on-site by implementing the identified stormwater strategies.

Marching toward Net Zero requires a holistic approach to addressing energy, water, waste, and stormwater on multiple levels. Key strategies must be implemented at every level: installation-wide planning, district and neighborhood scales, individual facilities, policies, and personnel behavior. The SCP at Parks RFTA has been used to synchronize energy, water, waste, and stormwater strategies with the Master Plan. The SCP process has allowed Parks RFTA to be stewards of the environment, reduce resource use, and provide a sustainable future for Soldiers, families, and civilians.

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Presidio Retro-Commissioning Case Study: Khalil Hall

by Brian Clark


Presidio of Monterey, California Public Works began using in-house labor to perform retro-commissioning assessments in 2012 as a means of better addressing its underperforming facilities. Being a newer Army facility, Khalil Hall was constructed to the rigorous Leadership in Energy and Environmental Design Silver standard and contained high-efficiency equipment supporting its

80,000 square feet of class and office space. Utility bills, however, indicated a lack of performance as compared to expectation. After receiving RCx training through the local utility Pacific Gas and Electric's Pacific Energy Center, Presidio engineers were able to realize over 25 percent in total energy savings to keep Khalil Hall operating in a manner commensurate with its design and capabilities.


Acronyms and Abbreviations	
HVAC	Heating, Ventilating, and Air Conditioning
BAS	Building Automation System
RCx	Retro-Commissioning

How a building is scheduled can have substantial impacts on its energy requirements. As part of the RCx of Khalil Hall's startup process, interior temperatures were trended against outside conditions in the early morning to establish a relationship between ambient temperatures and how early building HVAC needs to be turned on to warm up classrooms and offices. Temperature trends revealed that due to the building's high levels of insulation and tightness, warm up occurred very quickly regardless of outside air conditions. The building automation system, however, was configured to always provide one hour of fan and boiler warm up operation before occupancy. Reconfiguring the BAS to include a linear reset of warm up times based on interior zone requirements now provides a much more on-demand startup process. Additional scheduling findings included excessive run times in the evening for a now defunct study hall program and a lack of nine recurring holiday shutdowns in the BAS's calendar.

Further analysis of the BAS revealed additional inefficiencies in Khalil Hall's programmed sequence of operations. As a result of being installed with a standalone BAS system having no network connection to operations and maintenance or Public Works personnel, use of the sophisticated heating, ventilating, and air conditioning controls and meter data at Khalil Hall was being limited to simple troubleshooting following occupant complaints. Presidio engineers found that faulty information technology equipment and programming had resulted in unwanted nighttime operation of building HVAC systems, sometimes for days at a time without shutdown. Other programming sequences were added to enhance functioning systems, including optimization of duct static pressure levels and mixed air economizer set points through simple




Know Your Thermostat




When is it okay to open windows?

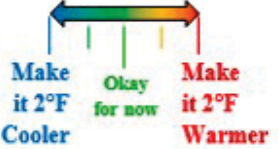
Weather	Okay If
Cold	Never (lost heat)
Cool	T-stat to "COOL"
Mild	T-stat to "COOL"
Warm	T-stat to "WARM"
Hot	Never (mold risk)
All	Only when occupied



Override Button:
Push this button in classrooms for additional heat and ventilation after 3pm

Room Schedules
M-F: 7am to 3pm (classes)
7am to 5pm (offices)
(auditorium on motion sensors)






Temperature Selector:
Slide this switch to adjust room temperature by plus or minus 2°F

?

For all energy-related questions call:
DPW Energy Manager
(831) 242-7508



Keep in mind:
Army Regulation 420-1 mandates:
68°F heating & 75°F cooling set points
and prohibits use of portable heaters

Retro-commissioning is a whole-building analysis that acknowledges the occupant's role in a facility's energy systems and can identify opportunities for optimizing human behavior, as shown with this thermostat overlay.



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manipulation of logic blocks in the BAS. Some of these sequences are now standard in new Army construction projects; however, there is no mechanism outside of RCx to reprogram them into newer buildings that can readily accept these types of efficiency changes.

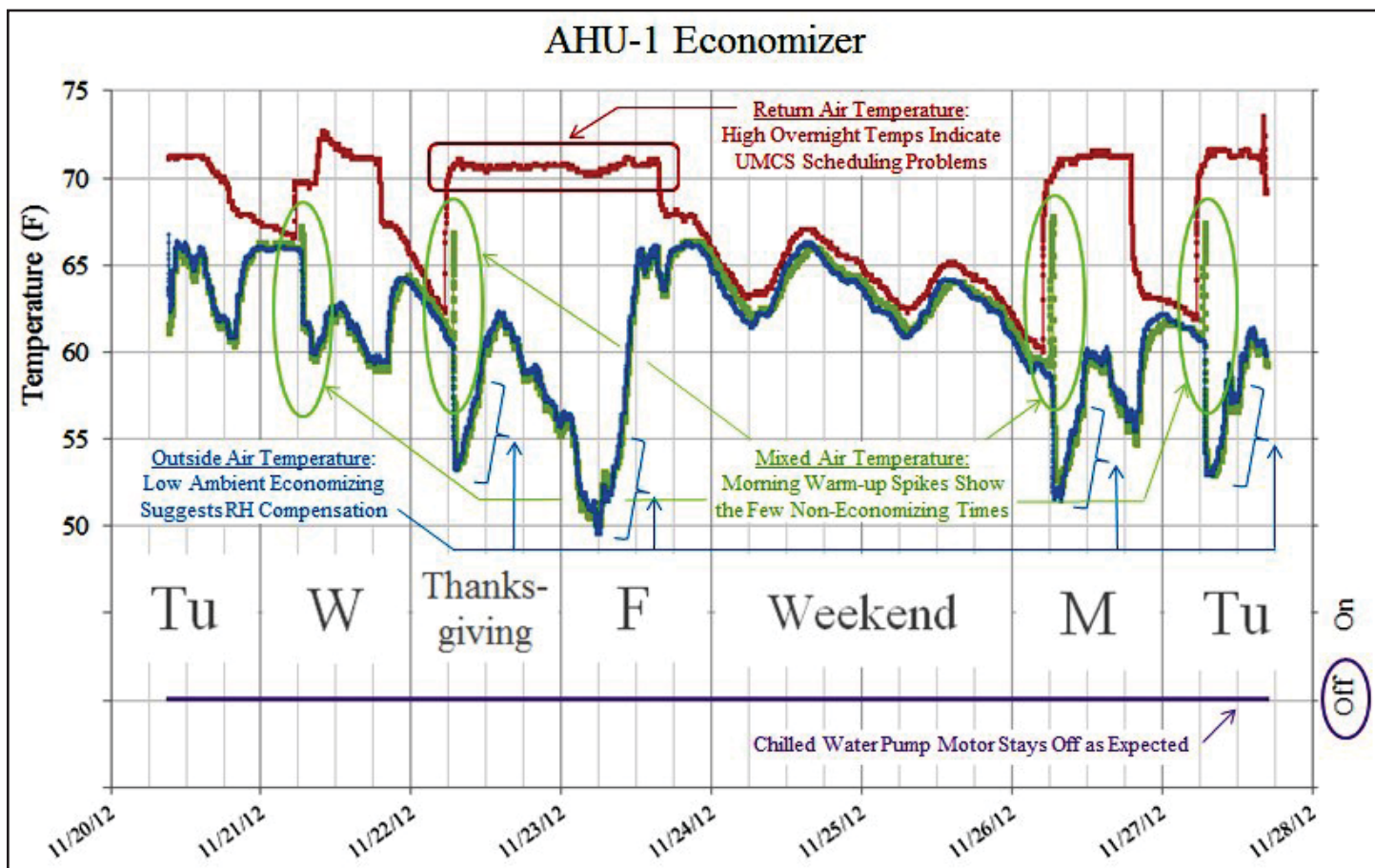
Specific pieces of equipment were also evaluated. This included a conference room air handler with unnecessary fan run times, ventilation air quantities, and preheat equipment; an oversized set of chilled water pumps; exterior lighting controls that could be altered to perform late-night shutdown; and Energy Star vending machines that were not configured with Energy Star settings. While some of these problems stem from mistaking efficient

equipment with efficient systems during design and construction phases, many RCx findings result from being able to listen to the building for feedback on potential opportunities. For instance, a design decision was made not to include lighting motion sensors for the few fixtures in each of the six break rooms. As part of the RCx process, Public Works engineers were able to plant light and occupancy loggers in each room for two weeks and monitor actual usage of the room and its fixtures to make the more informed decision that motion sensors in this application would, in fact, pay back.

Understanding that some of these opportunities are related to how occupants utilize their facilities, the RCx team introduced many outreach measures at Khalil Hall. As an example, Public

Works has installed thermostat labels that instruct occupants on what their unmarked thermostat switches and buttons do (as well as other information on window usage, Army set-points, and who to call with questions or problems). With clear guidance on how to continue conditioning a room after hours using the override button, Presidio engineers have established leaner schedules in rooms that are not occupied regularly or all day for fan and heating or cooling savings. Thus the RCx outreach effort at Khalil Hall not only educated and empowered its tenant population but has yielded quantifiable savings.

It's often been said that much of the low-hanging fruit in the form of lighting projects or simple HVAC improvements has already been plucked at many



Retro-commissioning skills such as data trending with portable loggers or automation systems help uncover operational issues that a snapshot might not, as shown in this economizer analysis.



Huntsville helping commissaries reduce energy, water consumption

by Julia Bobick

The U.S. Army Corps of Engineers, Engineering and Support Center, Huntsville's Energy Division is assisting the Defense Commissary Agency in developing a comprehensive energy reduction plan that delineates the path DeCA must take to achieve mandated energy reduction goals for its West Area sites.

DeCA, which consumes about 1 percent

of the total Department of Defense energy, needs a roadmap in order to achieve the newly mandated energy reduction goal by 2025, according to Clyde W. Reynolds, DeCA's director of Engineering.

Executive Order 13693, Planning for Federal Sustainability in the Next Decade, signed in March, directs federal agencies to ensure 25 percent of their total energy consumption is from clean energy sources

Acronyms and Abbreviations	
DeCA	Defense Commissary Agency
EEAP	Energy Engineering Analysis Program

by 2025; reduce energy use in federal buildings by 2.5 percent per year between 2015 and 2025; and reduce water intensity in federal buildings by 2 percent per year through 2025.

"We intend to meet the new energy reduction goals," Reynolds said. "DeCA hired the Army Corps of Engineers' Huntsville Center to develop for us a comprehensive Energy and Water Management Plan and associated energy management organizational structure based on their familiarity with how military installations operate and their expertise in all areas associated with installation energy."

The Huntsville Center Energy Engineering Analysis Program team will be looking at 71 of DeCA's West Area commissaries in the continental United States.

"We are developing a strategy that will enable DeCA to plan and execute sustainable initiatives to achieve their goals," said Raúl E. Alonso, EEAP program manager. "We are recommending the steps they should take, and how to go about implementing them." He expects to complete the project by February 2016.

"We will be developing a structure for DeCA to effectively implement energy conservation measures and address any renewable energy opportunities at facilities, including solar panels and geothermal energy," said Mark Allen, the Huntsville Center project's lead electrical engineer ➤




Huntsville Center mechanical engineer Scott L. Sheffield and Energy Engineering Analysis program manager Raúl E. Alonso discuss heating, ventilation and air conditioning system features detailed in the building plans for the commissary at Redstone Arsenal, Alabama. Huntsville Center's EEAP team is preparing a comprehensive energy reduction plan for the Defense Commissary Agency's West Area sites. Photo by Julia Bobick

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of our bases. RCx represents the next generation of substantial energy savings opportunities, but this is often the hidden fruit that requires deeper analysis to identify or recover. Using

in-house RCx skills, Presidio was able to locate and capture the types of elusive savings that will become critical as Army installations continue to expect further energy reductions from its Public Works.

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Practicum teaches retro-commissioning skills for saving energy

by Brian Clark and Jay Tulley

A prominent Lawrence Berkeley National Laboratory study from 2009 suggests that retro-commissioning may be “the single-most cost-effective strategy for reducing energy, costs, and greenhouse gas emissions in buildings today,” with an average 16 percent in energy savings and a 1.1 year payback. Proper retro-commissioning of federal facilities is thus critical for meeting Army sustainability goals, yet the methods are highly technical. Despite this challenge Presidio of Monterey, California has established not only an in-house process

for RCx assessments, but a mechanism for teaching it to Department of Defense engineers, technicians, and energy managers.

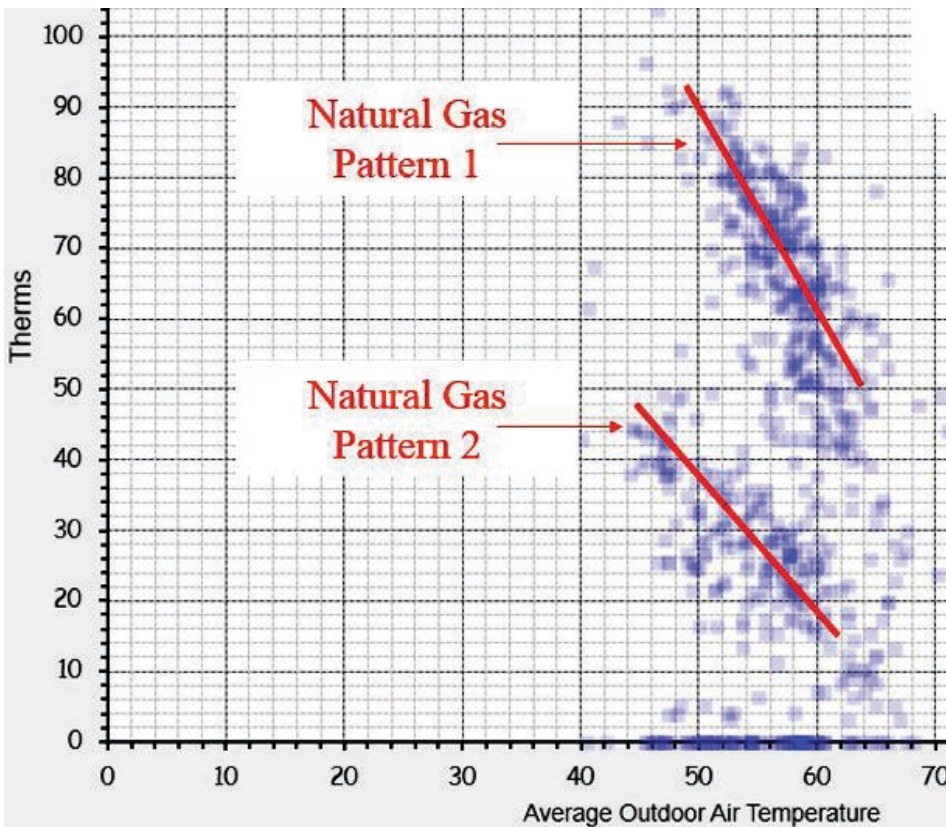
In contrast to initial commissioning processes that focus on quality assurance, RCx is primarily concerned with optimizing building energy systems. In the Army, RCx may be best known as an AEWRS reporting requirement or potential energy savings project. Yet at its core RCx can be more suitably classified as a method, one that ties together heating, ventilating, and air conditioning

Acronyms and Abbreviations	
DOD	Department of Defense
HVAC	Heating, Ventilating, and Air Conditioning
RCx	Retro-Commissioning
USACE	U.S. Army Corps of Engineers

fundamentals and controls with operational data analysis and functional testing techniques. And while RCx events can yield extraordinary energy savings, RCx skills are applicable to nearly every area of facilities management.

As part of a task order to provide RCx consulting services and training to Directorate of Public Works staff, Presidio kicked off its first RCx Practicum in July 2014. This weeklong workshop was made open to those in DoD tasked with improving federal building performance, and due to its success Presidio, held another practicum in July 2015. Participants are being taught key RCx skills through a combination of fundamentals webinars, off-site practice exercises and hands-on fieldwork. What started as an attempt by Presidio to investigate its problematic facilities has evolved into a forum for Public Works, U.S. Army Corps of Engineers, and others in DoD to really learn how their buildings operate while simultaneously optimizing the facilities that serve as the basis for instruction.

Modeled after successful private sector RCx training, the Presidio practicum helps develop practical field skills and design insights through the adoption of 10 important concepts. These include steps that can be preparatory to RCx efforts such as a review of relevant HVAC essentials and utility data analysis and benchmarking. However, at the heart of the practicum is field-level probing of building



Retro-commissioning skillsets help to establish a dialogue with the building. Can you see what this building is telling us about how a large mechanically-cooled auditorium is being used?


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who is also a certified energy manager. “It is also important we address staffing and training of the existing workforce to improve energy efficiencies and sustainability across DeCA facilities.”

Huntsville Center has an integrated energy program portfolio to help agencies develop and execute a comprehensive strategic energy portfolio. The Energy Division can execute a capital investment strategy for organizations through the use of one or more of the Center’s applicable

energy programs.

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Julia Bobick is a public affairs specialist with the U.S. Army Engineering and Support Center, Huntsville in Huntsville, Alabama. 



New course teaches strategies used to strive for Net Zero Waste

by Michael Andres

In January 2014 the Secretary of the Army issued Army Directive 2014-02, Net Zero Installations Policy. This memorandum set policy and assigned responsibility to strive toward Net Zero where fiscally responsible and in support of mission accomplishment at all Army installations. The directive delegates the implementation of the program to the Army Major



Net Zero Waste instructor and students at Fort Huachuca, Arizona. Photo by Giselle Rodriguez.

Command, therefore the Headquarters, Installation Management Command is now responsible to provide a forum for the installations to share ideas and learn new strategies to achieve the Net Zero Waste goals.

In response to the Army Directive, IMCOM transitioned into the Net Zero Waste Program management by continuing the monthly collaboration call for the pilot installations and started the quarterly collaboration call with the rest of its installations. In addition, HQ IMCOM in conjunction with the U.S. Army Corps of Engineers Construction Engineering Research Laboratory, developed a Net Zero Waste course as part of the Fiscal Year 2015 Net Zero Waste Program execution.

The course is designed for the installation waste management staff and those responsible for generating waste. The focus of the course is on best management

Acronyms and Abbreviations	
DPW	Directorate of Public Works
IMCOM	Installation Management Command
MACOM	Major Command
QRP	Qualified Recycling Program

practices and strategies that are realistic given the extremely limited budgets for solid waste management programs. In addition, the course provides a forum to interact with MACOM leadership and their peers. This will ensure policies are uniformly understood and best practices disseminated. The dialogue includes Army and Environmental Protection Agency subject matter experts on Net Zero Waste program development and execution concepts.

The training objectives are achieved by mixing briefings with working sessions that engage participants in developing

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performance that entails initial scoping approaches, systems diagramming and thinking, portable logger or building automation system trending, functional testing, and HVAC operations data analysis. Yet identifying opportunities necessitates certain follow-up activities in order to accomplish energy savings; therefore, the practicum concludes with command-level presentations that use energy and financial calculations to package implementation measures for peer as well as nontechnical audiences.


Thus far Presidio has received participation from Fort Hood, Texas; Fort Hamilton, New York; Fort Carson, Colorado; Fort Huachuca, Arizona; Fort Riley, Kansas; Fort Greely, Alaska; Aberdeen Proving Ground, Maryland; Fort Irwin, California; White Sands Missile Defense, New Mexico; Fort Leavenworth, Kansas; and Fort Polk, Louisiana Public Works

directorates as well as from design and research engineers from USACE's design headquarters in central California and Engineering Research and Development Center's construction laboratory in Illinois. Corrective action on several opportunities, including carbon dioxide-based ventilation resets, economizer tunings, and simultaneous space heating and cooling, has put one practicum building on track for a 35 percent total energy reduction. Moreover, the survey feedback from attendees at these events has been overwhelmingly positive and often touted as the type of technical training sorely needed by facilities management teams.

Presidio is preparing for its third year as host to the RCx Practicum and is continuing to improve the transfer of these skills to other Army energy managers and engineers with the development of consolidated online resources, virtual office hours and even more focus on fieldwork. If you are interested in attending or sending someone from your staff in the summer of

2016, please use the contact information below to request a seat in the class (to maximize the field component the practicum is organized into a handful of small teams so space is limited). Attendees can expect to gain exposure to hydronic and air-side equipment operation, building automation systems, portable data loggers and other building performance instruments, system diagrams, applied psychrometrics and several analytical tools to support facilities engineering and systems optimization. For a four-minute video summarizing practicum activities, visit www.tinyurl.com/pom-rcx.

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Brian Clark, PE, is a Mechanical Engineer and Jay Tulley, PE, is the Energy Manager with the Presidio of Monterey, California Directorate of Public Works. 



USACE tool makes sustainability planning easier, faster, better

by Jim Frisinger

The U.S. Army Corps of Engineers is demonstrating new planning technology that integrates two proven software tools to help installations meet tougher sustainability requirements.

Writing Sustainability Component Plans, which help master planners identify long-term conservation measures to reduce energy, water, and waste, requires time-consuming data collection. This new tool simplifies and speeds up the process as well as responds to several sustainability initiatives, energy directives, and Army Net Zero initiatives for a new approach to manage and optimize energy flows on Department of Defense installations.

A USACE team, under a project from the Environmental Security Technology Certification Program, is demonstrating the new tool this year. The tool puts

installation managers in charge of implementing energy plans, improving upon the SCP process without the need for outside consultants, said Susan Wolters, the project manager from the Fort Worth District USACE Regional Planning and Environmental Center. The streamlining means the time-intensive data collection and reporting requirements of the one-off SCP can now be replaced by an iterative process that can easily update studies as conditions warrant. It reduces the time, and hence the cost, of doing energy planning, she said.

Planners at Fort Hood, Texas, were an eager audience in August when the USACE team demonstrated the concept. Fort Hood is the Army's largest energy consumer, managing more than 2,000 facilities on its 214,895-acre footprint.

Acronyms and Abbreviations	
ADP	Area Development Plan
CAMPS	Comprehensive Asset Master Planning Solution Dashboard
DOD	Department of Defense
EEMs	Energy Efficiency Measures
ERDC	U.S. Army Engineer Research and Development Center
NZP	Net Zero Planner
SCPs	Sustainability Component Plans
USACE	U.S. Army Corps of Engineers

Already a sustainability leader, the post is working to meet more stringent sustainability requirements. Executive Order 13693 of 2015, when implemented, requires a cut of 2.5 percent in energy use every year for the next 10 years, with at least 30 percent of it from renewable sources by 2025. ➤

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products based upon their shared expertise. By the end of the three-day course, installation participants are expected to have:

- An understanding of current Army policies on waste reduction, reporting, and Qualified Recycling Program management
- A pathway identified to achieve Net Zero Waste goals
- A better understanding of hazardous and special waste requirements

The three-day training sessions comprise:

Day One – Host Training. Attendees: Representatives from across the host installation, to include Directorate of Public Works, Logistic Readiness Centers, Army and Air Force Exchange Service, Defense Commissary Agency, and Environmental compliance officers from a variety of activities and tenants.

Goals:

- To understand what does and does not work in the host's current program, providing immediate feedback to the DPW
- Teach about the Net Zero Waste concept and how this approach may help them improve their current efforts
- Identify near and far term challenges to effective waste diversion and potential mitigation strategies

Day Two – Policy and Net Zero.

Attendees: Solid waste and/or QRP manager from each regional installation.

Goals:

- To understand the Army policy requirements relating to waste management and Net Zero Waste goals
- To provide guidance on effectively achieving Net Zero Waste goals
- Discussion of QRP staffing strategies

Day Three – Technical topics. Attendees: Solid waste and/or QRP manager from each regional installation.

Goals:

- To learn about important technologies for waste diversion from Army subject matter experts
- Discussion of regional opportunities for community partnerships
- Discussion of regional waste trends with EPA expert
- Final strategizing taskers for waste diversion planning
- Out brief to host installation command

The initial course offerings were conducted at Fort Huachuca, Arizona, the week of Aug. 17 and at Fort Gordon, Georgia, the week of Sept. 14. Additional courses will be scheduled and the DPW will be notified of availability.

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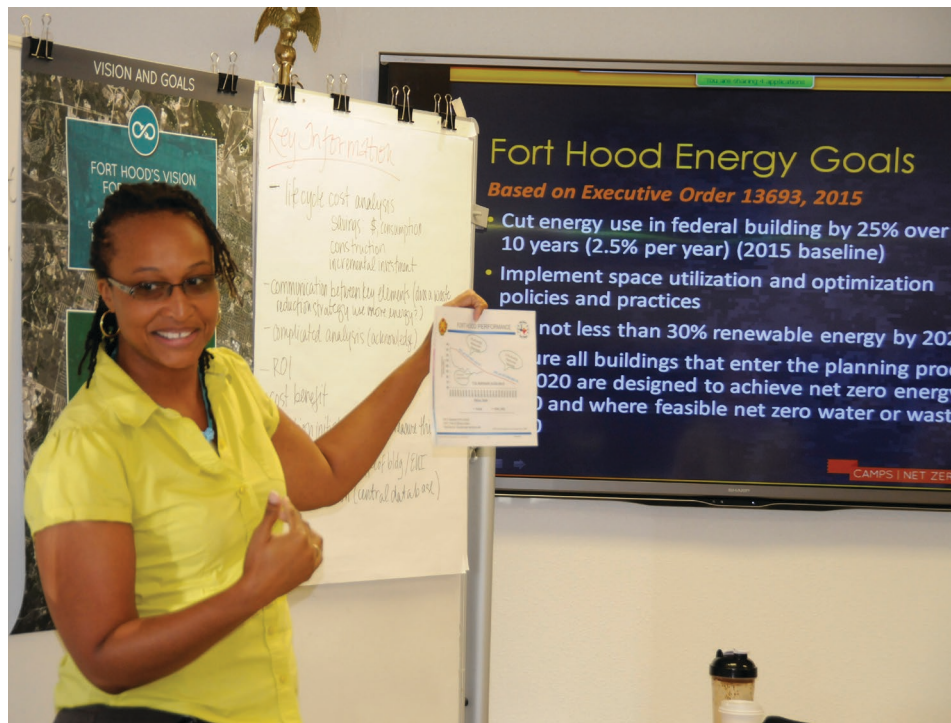
One of the two tools is the Comprehensive Asset Master Planning Solution Dashboard. Fort Hood developed this master planning tool with USACE and Ecology and Environmental, Inc. CAMPS provides Fort Hood a consolidated “mashup” of tenant, facilities, and mapping data. Planning, energy, maintenance, engineering, environmental, and tenant organization commanders have gravitated to CAMPS for its user-friendly design and visuals.

The other tool is the Net Zero Planner, developed by U.S. Army Engineer Research and Development Center. Its robust energy forecasting capabilities knit together an analysis of energy efficiency measures at the building level with EEMs that have an installation-wide scope, such as cogeneration and wind. The Fort Worth District has been utilizing NZP in the development of SCPs over the past year, and this year NZP is being adapted to analyze water and solid waste.

The project seeks to prove the integrated tool’s applicability across DOD by demonstrating it both at Fort Hood, a CAMPS-savvy site – and at Joint Base Pearl Harbor-Hickam, Hawaii – which hasn’t had CAMPS.

Here’s how the new tool works: Installation personnel are trained to set up an energy study driven by the short- and long-term phasing and vision of an Area Development Plan. Planners set specific parameters/goals for each study. Once designed, the study request, which draws on existing ADP planning and metering data, is sent to NZP for analysis. The August workshop produced energy study results for the 1st Cavalry Division ADP.

NZP then runs hundreds of different scenarios in its analysis and in a matter of an hour can produce results. The NZP output lists investment and lifecycle costs



Africa Welch-Castle, a Fort Hood, Texas, mechanical utilities engineer at the Directorate of Public Works Energy Management Branch, shows how far the installation has come with cutting energy use – and how much further it is being asked to go. Photo by Jim Frisinger.

for each alternative presented. It reports a number of energy usage reduction alternatives that visualize energy flows, shows flagging facilities consuming excessive energy compared to benchmarks, and identifies EEM opportunities. Installation managers then select their preferred alternative to transform into an execution plan recommendation aided by the visual communication powers of CAMPS.

“With CAMPS already housing all the building and metering data, it overcomes the cumbersome process of collecting it for the NZP to process,” Wolters said. “By combining the two tools, all that data management is performed one time for CAMPS. You select the site in which you want to create the study, the data are already there, you run several simulations and moments later the study enumerations

include better and best energy scenarios.”

The time-intensive nature of energy planning activities – typically requiring several months overall – meant that they are typically conducted every few years. But by combining CAMPS with NZP, these can be integrated into the daily work flow and updated multiple times a year as needed, requiring a couple of weeks overall.

The new tool will inject new ideas proven at other installations and help Fort Hood “think a little more outside that box we were getting ready to fall into,” said Africa Welch-Castle, a Fort Hood mechanical utilities engineer at the Directorate of Public Works Energy Management Branch. The base is already using lighting retrofits, tightened building envelopes, solar thermal, photovoltaics, condensing water loops and ground source heat pumps, she said. “But what else ➤



Electronic library helps save time, money, energy

by Bob Romic

When it comes to saving time, money, and energy, the U.S. Army Corps of Engineers Electronic Library is leading the way in conserving resources and helping employees to effectively get their jobs done. The UEL, a digital collection of peer-reviewed professional journals and reference manuals, is available to thousands of Corps employees around the world for use in executing engineering programs, researching environmental projects, and supporting the overall mission of the Corps.

The idea of the UEL started in 2006 when six districts decided to join together and contribute funds for online research materials of 90 subscribed journal titles. This later blossomed into a system allowing Corps-wide access to 3,000 professional journals and 2,000 online reference manuals for approximately 32,000 employees worldwide.

All USACE locations (outside the research labs) have right of entry to the

system, and use of the UEL has grown as more employees find value in having easy online access. One issue facing nearly half of the Corps' districts was the lack of a district-level library. Employees working at these offices would often drive to local universities or community libraries to request the use of reference materials.

In a recent survey about the UEL, it was found that users feel access to professional journals is a must for any engineering organization and that the annual cost of the system is well worth the service that it provides to the organization. The engineering reference tools produce a 1-to-4 return on investment as each download on average represents \$35 in savings. In 2014, the Corps estimated the use of the UEL provided approximately \$2,859,010 in cost savings when compared to the cost of purchasing the material through an outside vendor and a projected \$13.5 million in cost avoidance by consortia purchasing.

For the Corps, saving money is a plus

Acronyms and Abbreviations	
UEL	U.S. Army Corps of Engineers Electronic Library
USACE	U.S. Army Corps of Engineers

but the larger mission of environmental stewardship also played a role in the creation of the UEL. Using the electronic system, environmental and civil engineers have access to online reference manuals to learn about improving building energy efficiency, designing and implementing sustainable energy systems, and limiting the effect of development on water resources. The digital reference manuals available through the UEL cover energy saving topics like biofuels, biomass gasification, fuel cells, photovoltaic, hydroelectric and wind power generation, wind turbines, energy efficiency, Leadership in Energy and Environmental Design, sustainable building and site development, and protection of groundwater and aquifers. These subjects, along with many others, are covered in the professional journals and online reference tools available through the UEL. The list provided in the graphic shows a sampling of the professional journals available in the UEL.

In an effort to continue to support standardization, consistency, and effective use of government funding, the Corps' Library Program aims to continue this service, allowing greater distribution of research material at a significantly reduced cost and connecting Corps researchers to contemporaries schooled at universities where online access is the norm. For additional information about the UEL program, please contact the U.S. Army Corps of Engineers Library Program at Library@usace.army.mil.

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can we do? What gets us closer to Net Zero energy?"

The new tool will also help translate energy studies into visual presentations that help her sell new EEMs up the chain of command to compete for Net Zero funding.


Michael Case, NZP Program manager at ERDC-Construction Engineering Research Laboratory and a co-principal investigator for this project, said demonstrating how NZP-CAMPS can generate efficiency measures for water and solid waste would be a likely follow up. The tool could also be expanded to serve operations and maintenance as well as sustainment, restoration, and modernization planning in combination

with BUILDER's software suite.

"We always say, 'Don't make short-term decisions without a long-term plan'," Case said. "By bringing all these systems together it makes it a lot easier to keep the long-term plan in mind when you're making the day-to-day decisions."

VIDEO LINK FOR Net Zero Planner TM: <https://www.dvidshub.net/video/424237/net-zero-planner-energy-planning-tool>

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Jim Frisinger is a public affairs specialist for the U.S. Army Corps of Engineers Fort Worth District. 



Educational opportunities available for sustainable planning

by Andrea Wohlfeld Kuhn and Lyndsey N.D. Pruitt

Are you a planner, engineer, architect, project manager, realty specialist, or employed in a related position and need to gain a better understanding of how the master planning process works and how planning can help achieve net zero energy, water, and waste goals? With the May 15, 2012, publication of the Department of Defense Unified Facilities Criteria for Installation Master Planning (UFC 2-100-01), it is more important than ever to employ an integrated, sustainable approach that includes master planning.

The DOD Master Planning Institute operates under the auspices of the U.S. Army Corps of Engineers Proponent Sponsored Engineer Corps Training program. Courses offered range from introductory level to advanced and include universal planning practices as well as DOD and Army-specific information. Attendees include DOD, other federal agencies and private sector representatives. This mixture of attendees offers an opportunity for interagency and private sector sharing of best practices and innovative, sustainable approaches to master planning.

All courses are fully accredited by the American Institute of Certified Planners, American Institute of Architects, and National Society of Professional Engineers and provide continuing education units.

Instructors employ a variety of dynamic media that goes beyond lectures and includes hands-on training, small group exercises, field trips, site visits, and other learning opportunities. While basic theory and history are necessary parts of the curriculum, students have the opportunity to develop ideas or plans that can actually be implemented at their locations. The instructional staff is composed of federal and private-sector professionals who are AIA and AICP accredited subject matter experts.

Although students are encouraged to take Course 75, Master Planning Principles, early in their training program, there are no prerequisites for any of the master planning courses, and they may be taken in any order. The instructor team is available to travel to your installation or regional location, which

often results in reduced costs per student and the ability to reach an entire team(s) at once.

Course Descriptions: Below are brief descriptions of Fiscal Year 2016 DOD Master Planning Institute classes, with more detailed descriptions, costs and registration available at <http://ulc.usace.army.mil> or <http://www.dodmpi.org/>. Area Development Plan Workshops are listed on the DOD Master Planning Institute website at <http://www.dodmpi.org/>.

Course 75: Master Planning Principles

This course provides an introduction to master planning concepts and principles, including the comprehensive issues of sustainability and energy. An overview of the planning process is provided, including applying the principles of UFC 2-100-01, with an emphasis on general planning principles that are applicable to all organizations and government entities.

Course 258: Master Planning Energy and Sustainability

This course covers energy and sustainability on a broader planning level, rather than building design. Students will alternate between learning effective strategies and applying sustainability planning practices in a mock-planning exercise. Classroom learning is enhanced by field trips and demonstrations of energy/water-saving methodologies from a planning and design perspective, including metrics to evaluate life cycle cost.

Course 241: Master Planning Practices

This course expands on the basic sustainable, energy efficient planning concepts in Course 75 and relates them to Army-specific examples and practices, including analysis of requirements and forecasting. Students will learn the steps of the Army master planning process to identify components and understand the difference between short- and long-term planning horizons, the concept of capacity planning, and formulation of customer requirements.

Course 392: Master Planning Sustainable Historic Structures

Acronyms and Abbreviations	
AIA	American Institute of Architects
AICP	American Institute of Certified Planners
DOD	Department of Defense
DODMPI	DOD Master Planning Institute
PE	National Society of Professional Engineers
PROSPECT	Proponent Sponsored Engineer Corps Training

This course focuses on instructing planners, historic preservation experts and those in related fields on how to integrate the master planning process with applicable laws, regulations and UFC 2-100-01 (Installation Master Planning) while addressing the unique characteristics of historic structures. Sustainable, energy-efficient solutions for historic preservation and footprint reduction, as well as pertinent laws, regulations, and guidance are covered.

Course 319: Master Planning Guideline Implementation

This course provides students with an understanding of the concept of form-based coding and its use in the planning and development of sustainable installations. Students will learn how to develop a code, planning standards, and create a regulatory plan for code enforcement.

Course 326: Master Planning Program Execution

This course provides an overview and techniques to develop real property requirements and allowances, assess stationing actions, and ensure sustainability and energy factors are included. Students will learn to use Army planning tools to conduct planning studies and requirements analyses and determine the impact to the installation's real property master plan.

Course 948: Master Planning Visualization Techniques

This course provides an overview of visualization techniques and offers hands-on training in using Google SketchUp and Google Earth. Students will produce several basic Area Development proposals using these tools and gain knowledge of the



Fort Hood workshop builds Sustainability Component Plans

by Amy Seaman and Tricia Kessler

Five years ago, in a series of intense, weeklong, hands-on workshops, Soldiers, Directorate of Public Works employees, and multiple stakeholders across Fort Hood, Texas, created Area Development Plans for the installation's 11 districts. That effort culminated in an overall Installation Development Plan incorporating and summarizing all of the ADPs.

This year, Fort Hood Planning is taking those ADPs one step further, using them as the basis for a series of Sustainability Component Plans and an Installation Sustainability Component Plan. These SCPs will guide Fort Hood as it moves toward sustainability goals in energy, water, waste, and stormwater.

Each of these categories is governed by federal reduction requirements. Executive Order 13693 of 2015 requires reductions in energy and water consumption; Fort Hood is a Net Zero Waste installation, striving to achieve zero waste to landfills by 2020 and the Energy Independence and Security Act of 2007 requires 100 percent on-site mitigation of impervious surface stormwater run-off.

These reduction challenges cannot be met without robust stakeholder involvement.

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concepts of scale, massing of facilities, landscaping, architectural compatibility, and force protection requirements.

Course 952: Master Planning Advanced Techniques

Through an intensive, hands-on workshop, students use a planning charrette technique to develop an Area Development Plan for a real world planning problem at an installation. Advanced concepts and cutting-edge sustainable and energy-efficient practices are featured. Participants are required to have a fundamental knowledge of master planning or real property management, and although they are encouraged to take Course 75 before this, there are no

Beginning in January 2015, Fort Hood has sponsored a series of SCP workshops to educate installation stakeholders and glean sustainability ideas through collaborative engagement. Leadership within the DPW developed vision, goals, and strategies for reduction in each category. Installation stakeholders, including Jennifer Rawlings, Net Zero Waste project officer, and Africa Welch-Castle, mechanical engineer in DPW's Energy Management Branch, and leadership vetted these in subsequent workshops, providing a list of achievable ways to meet the vision and goals.

Fort Hood Sustainability Visions:

Reduce energy consumption and increase energy security by changing the culture, adopting renewable energy sources, and leveraging technology.

Reduce water use by changing the culture, maintaining and improving the water system, and adopting water reuse when practical.


Achieve Net Zero Waste by changing the culture and leveraging technology to reduce, repurpose, recycle, or compost all possible materials.

Protect life and property by maintaining and improving the stormwater system and integrating low impact development

prerequisites for this or any of the other master planning courses.

Register now and increase your understanding of sustainable planning by signing up for one or more of these courses at <http://ulc.usace.army.mil/> or <http://www.dodmpi.org/>.

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Acronyms and Abbreviations	
ADP	Area Development Plan
DPW	Directorate of Public Works
IDP	Installation Development Plan
ISCP	Installation Sustainability Component Plan
NZP	Net Zero Planner
SCP	Sustainability Component Plan
USACE	U.S. Army Corps of Engineers

management practices.

Using the visions and strategies developed by the installation, the stakeholders created maps depicting how the strategies can be applied in each district. For example, stormwater maps show where trees, bio-swales, and engineered wetlands can be established to mitigate stormwater. Energy maps show possible locations for photovoltaic panels, microgrids, and district energy systems. Having stakeholders from each district as well as experts from DPW participating in the workshops ensures that the strategies can be tailored for all districts on the installation.

For energy reduction, Net Zero Planner, an exciting tool developed by U.S. Army Corps of Engineers, Engineer Research and Development Center-Construction Engineering Research Laboratory, and the USACE Fort Worth District, adds another dimension to the SCP. This tool takes data from the installation for every building, including size, mechanical



A participant in a workshop conducted by Fort Hood, Texas, creates a waste sustainability map that will support the installation's Sustainability Component Plan. Photo by Tricia Kessler.



Career Development: What does your resume say about you?

by Dr. Jim Hearn

A few years ago, I penned some articles on career development, and I think it is time for a refresher. While I have taught countless brown-bag presentations on this topic, I continue to see poor resumes and poorer interviews. I don't want you to miss out on a great opportunity because you are not the best prepared when the opportunity comes your way.

Be ready to take advantage of luck, it will play a great part in your career. However, you have to be ready to seize the opportunity. If you haven't dusted off and updated your resume within the last six months, you are risking not being competitive and, let's face it, competition is tough. Your resume is your way of marketing yourself. It tells your story. Is your story compelling? Does it make me want to interview you?

What do you not want to do? Generic resumes just don't cut it. Many resumes follow a job description almost to the letter. I normally know your job description, and it only tells me what you were supposed to do. It is a waste of a hiring manager's time reiterating what we already know. If everyone copies his/her job description, you all look the same. Instead, use examples, statistics, and qualifying or

quantifying descriptors to highlight your accomplishments and make your resume tell your story. Action words make your resume come alive. Additionally, address the requirements in the job announcement. They are what the selecting official is looking for and they are usually in priority order. If you don't address them, you are unlikely to get an interview.

What else do you not want to do? You don't want to apply for a GS-14 job with a GS-09 resume. Clean up your resume. Put past jobs in the past tense. When you don't (and people don't) change the tense, it tells me you did not care to present your best effort. Don't list every course that you had in college or every training course that you attended. Do list specialized courses or training that is germane to the desired position. Don't list every single individual award. If you are applying for a senior position, don't list that you were awarded a Battalion Coin in 1987. I expect you to have dozens of them. Do consolidate and summarize those types of awards. Do list honorarium or significant recognitions. Also, don't list every performance award either. Summarize performance awards such as, "top block for 10 years running."

OK, your resume has caught my



attention, but that only gets your foot in the door. It is the interview that has the biggest effect on the selection panel. If the resume is a marketing document, then the interview is a marketing pitch. Look sharp and know your "brand." Present the person that you are and not who you think they want. Remember, you are interviewing them as they interview you.

Be prepared. Ensure you understand the culture of the organization and not just the job that was announced. Anticipate the questions. Show that you did research on the organization and tell them how you want to make their organization better. Use examples to highlight your responses. Also, it is important to not ever assume that you are owed a job even if you were acting in the position previously. If you know the panel members, be respectful and don't be too familiar with them. You will lose your competitive drive.

In addition to showcasing your knowledge, skills, and abilities, show energy through confident responses and riveting eye contact. If it is a senior level supervisory position, have a vision of how you would like to move the organization forward. Thank the panel and assess your performance.

Your next career opportunity could be right around the corner. Be ready by being prepared!

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Dr. Jim Hearn, Senior Executive Service, is the Director of Regional Business for Northwestern Division in Portland, Oregon.

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systems, and building materials and runs analyses that project the most efficient energy reduction alternatives for existing building upgrades, as well as new building system designs. These alternatives inform DPW how to use restoration and maintenance dollars most efficiently to reduce energy consumption in buildings.

The group dynamics at the workshop that create solutions to sustainability problems, and the high-tech NZP program that forecasts complicated energy use alternatives, combine to produce a product – the SCP – that provides DPW a way forward to reach sustainability goals. The SCPs, which

discuss specific project strategies for each district, will be summarized in the ISCP. The ISCP will also outline overall policies and programs to support culture change, because sustainability has as much to do with behavior as buildings. Fort Hood, already a leader in sustainability, is moving the Army one step forward with their SCP initiative.

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Amy Seaman is the community planner in the Master Planning Branch at Fort Hood, Texas. Tricia Kessler, AICP, is the Chief Strategic Officer and a senior planner at The Urban Collaborative LLC. She is The Urban Collaborative project manager for the Fort Hood Master Planning effort.



Course provides hands-on training approach to sustainable planning PROSPECT Course 258, “Master Planning Energy and Sustainability”

by Andrea Wohlfeld Kuhn and Lyndsey N.D. Pruitt

The room is electric with a flourish of intensity as teammates rush past each other in an effort to complete their presentations and finalize last-minute design changes. One group secretly discusses the logic behind the selected roof typology while another group calls out Energy Use Intensities to be documented on a poster. They are preparing to give a peer-graded presentation about the energy and sustainability performance of their site, either a research campus or a town center.

“Pens down” announces an instructor.

Heads lift across the room and participants gather around the first grouping of tables. Here lies a carefully orchestrated set of 3D building models set atop hand-rendered plans annotated with energy and sustainability strategies. The first group starts their review with an acknowledgement that their plan complies with the Unified Facilities Criteria for Installation Master Planning, UFC 2-100-01. They then discuss which buildings they chose to renovate, demolish, and construct within exercise limits. They elaborate on the revisions made to their form-based code to support a roof typology appropriate to the historic context of their site but also with maximum benefit for solar orientation. They point out specific buildings with high-energy use and how they offset them with renewable sources. They talk about low impact development and stormwater best management practices. They identify waste infrastructure and potable water savings. They banter, they deliberate, and they announce Net Zero!

Four more groups follow this pattern, each with a tailored solution toward their site. Site-specific solutions are needed to achieve the high levels of efficiency at low life cycle cost as directed by the new Presidential Executive Order 13693, “Planning for Federal Sustainability in the Next Decade.” It is not enough for students to learn independent strategies; they must understand the holistic effects and the relationship between strategies. When applying sustainability strategies,

many architects, engineers, and planners erroneously solve for energy or water performance and do not consider the tangential implications. For example, installing photovoltaic panels on parking structures increases the real property value of the parking lot. In many situations, this is a benign effect; however, if the master plan calls for infill development of the parking lot in the long-term, the increase in real property value may mean the site is undevelopable. In the latter circumstances, the application of PV affects the density, walkability, and connectivity of the long-term plan.

To support planners and the greater defense community in understanding and overcoming these challenges, the U.S. Army Corps of Engineers offers Proponent Sponsored Engineer Corps Training (PROSPECT) course #258 “Master Planning Energy & Sustainability.” This course provides planning exercises with realistic conditions in regard to budget, federal policy compliance, and building constraints to challenge students not only to learn the sustainability strategies, but also to understand their implications and strengths.

The course covers planning level strategies in energy efficiency, potable water savings, solid waste reduction, and stormwater mitigation from impervious surfaces. Special topics such as climate resilience and historic preservation supplement the course. Further, the course is an opportunity to engage planners in the latest technology with a special segment supported by staff from the USACE Engineer Research and Development Center-Construction Engineering Research Laboratory. In the 2015 class described above, CERL representatives presented the Net Zero Planner tool, a Web-based application that integrates energy planning and engineering trade-off analysis at building and installation levels. The NZP is a dynamic planning and analysis tool that can be reused as conditions change. It integrates with

Acronyms and Abbreviations	
CERL	Construction Engineering Research Laboratory
DoD	Department of Defense
ERDC	Engineer Research and Development Center
NZP	Net Zero Planner
PROSPECT	Proponent Sponsored Engineer Corps Training
PV	Photovoltaic
USACE	U.S. Army Corps of Engineers

the master planning process to help installations assess strategies for achieving Net Zero energy. Water and solid waste will be integrated into the NZP in the future.

The enthusiasm and creative ideas generated by PROSPECT Course 258 (recently held at the USACE Seattle District Leadership in Energy & Environmental Design Platinum rated building) has carried over into the attendees’ daily work and can be seen at numerous Department of Defense installations. Fresh approaches to achieving Net Zero energy, waste, and water can be realized by using a planning perspective, which emphasizes a holistic approach. The next offering of this course will April 2016, and students of all levels of experience and background are welcome to attend. A complete list of PROSPECT master planning courses can be found by going to <http://ulc.usace.army.mil/> and clicking on “FY 2016 Schedule” and then “M” for master planning courses.

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