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Waste**

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An innovative air curtain at a Fort Wainwright, Alaska, outdoor firing range provides a barrier to cold weather, making it tolerable for Soldiers rotating through the fort to weapons qualify in midwinter. The air curtain is a demonstration project of the Installation Technology Transition Program. Photo by James Buska, Engineer Research and Development Center. Page 36

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Becoming net zero

by Robert M. Sanders

In the spring of 2010, Sierra Army Depot, Calif., was selected as a pilot net-zero installation for the U.S. Army. By definition, *net zero* means that the installation will be able to produce as much power as it consumes in a year.

Sierra Army Depot spends about \$8 million per year in energy to heat, light and cool its six million-plus square feet of useable space. This space includes 800 storage igloos, 27 separate 90,000-square-foot warehouses and a multitude of office and maintenance facilities.

Unfortunately, our remote location in the high desert of northern California does not foster the competition that brings about lower utility rates. The positive side of having higher utility rates allows for a shorter time frame to recoup any energy saving investments.

The depot has undertaken a five-step approach to reach net zero:

1. Reduce the demand.
2. Educate the users of energy.
3. Measure the usage.
4. Partner with utility companies.
5. Produce renewable energy.

Reduce

To be able to create enough renewable energy, it is imperative to reduce the demand for energy. This goal can be reached by doing a number of small things as well as larger projects.

Install motion sensor light switches. Replace T12 bulbs with T8 bulbs or even LED lights, which use about one-third of the energy of conventional bulbs and last for up to 10 years. Add insulation. Install solar street lights, and replace older windows with low-e triple-pane windows. Replace older furnaces and boilers with high-efficiency ones. Talk with the Directorate of Information Management about a program to shut off computers and monitors when there is no activity for a while. Install tankless hot water heaters.



Robert M. Sanders
Photo by Lloyd Gubler, Sierra Army Depot

In designing a new building or a major retrofit, use the lessons learned by others. Face the building to maximize light and photovoltaic effectiveness. Put the utility rooms on the north side of the building. Paint the rooms with reflective paint and use reflective window sills to bring light into the rooms, which can reduce the number of fixtures needed. Use solar power to preheat make-up air. Use waterless urinals, and collect the runoff water for irrigation.

These actions are all cheap fixes that combined have a quick payback and, in some cases, actually reduce the cost of construction.

Educate

Sierra has started a program to update and educate facility managers about their energy usage. We also keep everyone thinking about energy by writing articles for our depot newspaper. A proposal is in the place to reward the 1,500-plus civilian employees of Sierra if they meet the 2009 presidential directive to reduce energy usage by 3 percent per year.

Getting people to recognize that energy is a precious commodity is paramount to an effective reduction program.

Measure

We are also installing utility meters where there were none to both meet mandates and to quantify and identify areas of high utility costs. This program

will help us to allow occupants of like buildings to compete against each other in energy reduction. An Energy Management Control System will allow us to tie all of the information together to control and lower our utility footprint.

Partner

By partnering with local utility companies, we can use the power from an adjacent geothermal plant to lower our rates. This capability will also keep our electrical grid operational on a more consistent basis.

Snow storms, high winds, desert heat and wild fires have caused us to experience numerous power outages. Partnering with our local power company will allow for a more consistent electrical grid.

In a world where budgets are being cut, we all have to spend our money wisely and efficiently. Numerous programs exist that will fund utility savings projects — Energy Savings Performance Contracts, the Energy Conservation Investment Program, power purchase agreements, the Environmental Security Technology Certification Program and a host of others. Through these instruments, private companies will spend their money to save you money. If it does not make sense, the energy services company will not gamble its money. If it does make sense, we need to take advantage of their dollars.

Renewable

Like most desert locations, the Sierra Army Depot has an abundance of sunny days. Photovoltaic fields can be placed in literally hundreds of locations on our 37,000 acres. We also have a known geothermal capability.

We are exploring numerous options and proposals to take advantage of the abundance of natural resources. The ability to produce power is a mandatory step towards achieving net zero.

Becoming net zero is not an easy task, but it is not impossible. It is just like

Supporting the move to net zero

by Col. William J. Leady

As commander of the U.S. Army Corps of Engineers' Sacramento District, I've seen firsthand the great projects the Corps has completed for Army posts throughout the western United States. Our district oversees construction for 13 Army installations and four Air Force bases, so we have a very robust Military Program.

We work very closely with one of those posts, Sierra Army Depot, Calif., to find innovative solutions to its energy, water and waste issues. We continue to build that partnership — working together to improve the installation, its facilities and roads for the benefit of the service members and their Families living and working on post.

As with other installations, we continue to serve Sierra through ongoing improvements to its infrastructure. As of the end of fiscal year 2012, we completed a wide variety of designs, building repairs and upgrades across the installation, including replacement of heating, ventilation and air conditioning systems; renovation of the water treatment plant; various paving repair projects; renovation of the fire station; roofing repairs; renovation of a warehouse into a conference center; and various electrical and mechanical renovation projects.

What I am especially excited about, however, is Sierra Army Depot's inclusion in the Army's Net Zero Initiative. It's one of eight pilot installations striving to achieve net-zero energy by 2020. We, in conjunction with the Corps' Engineering and Support Center in Huntsville, Ala., are already working with Sierra personnel on



Col. William J. Leady
Photo by Michael J. Nevins

ways to achieve this goal.

This is not the Sacramento District's introduction to the Army's new initiative. At another net-zero installation nearby, Fort Hunter Liggett, Calif., we've already completed a new solar microgrid capable of providing one megawatt of energy. An additional microgrid project, providing another megawatt of energy, is already under way. But the grids won't just provide renewable, clean energy; they'll also provide shade for the post's vehicle fleet, a huge benefit out here in the California sun. More sustainability projects are planned at Hunter Liggett, as well.

More recently, the Sacramento District upgraded housing units at Dugway Proving Ground in Utah. Among the modifications were ground-source heating and cooling and solar lighting, which reduces the need for electrical lighting during daylight hours.

The project was originally designed to meet a Gold rating in Leadership in Energy and Environmental Design — LEED, for short. Through collaboration with installation personnel at Dugway, the Sacramento District and project contractors were able to incorporate modifications that bumped that rating up to a LEED Platinum, the highest rating possible. This feat is an amazing — and not easily obtainable — accomplishment, demonstrating what a great relationship between the Corps and installation personnel can achieve.

Another great project, which had its ground-breaking ceremony just this August, is the new solar array at Tooele Army Depot, Utah. The array uses mirrors to concentrate sunlight into a small beam. The resulting heat powers a conventional electrical generator, a technology known as concentrating solar systems. The more than \$9 million project is the first of its kind not only for Tooele but for the entire Army and will generate 1.5 megawatts of power once complete.

New technology like the Tooele array and improved designs have helped make these projects work in various locations and have made the U.S. Army Corps of Engineers' Sacramento District an experienced and important partner in the Army's vision of net zero.

It's this experience and knowledge that we at the Sacramento District will bring and share with Sierra Army Depot in their journey toward net zero. It's a journey that I'm confident will improve Sierra and showcase it as an example to other installations throughout the nation.

Building Strong!

Col. William J. Leady, PE, is the commander, Sacramento District, U.S. Army Corps of Engineers.

Call for **ARTICLES**

The January/February/March 2013 issue of the

Public Works Digest will feature

Master Planning

Deadline is Dec. 12

Submit articles to
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202-761-0022

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eating an elephant. It can be done, but it must be done one bite at a time.

Robert M. Sanders is the director of Base Support, Sierra Army Depot.

Net Zero Initiative summary

by Wanda Johnsen, Paul Volkman, Kristine Kingery and Marc Kodack

The Net Zero Initiative made considerable progress in its first year, 2011-2012, with accomplishments both programmatically and at the 17 pilot installations that volunteered to participate in the initiative in the focus areas of energy, water and solid waste.

Programmatic activities included completion of the *Army Net Zero Installation Initiative Report to Congress* in April and preparation of a programmatic environmental assessment. Installation activities included completion of baseline energy, water and waste assessments and of road maps to achieving net zero.

Individuals within the Office of the Deputy Assistant Secretary of the Army for Energy and Sustainability, with assistance from the Office of the Deputy Assistance Secretary of the Army for Environment, Safety and Occupational Health and the Office of General Counsel, prepared a programmatic environmental assessment to gauge the potential environmental effects of implementing net zero beyond the 17 pilot installations.

Three alternatives were evaluated: no action, implementing net zero Armywide and strategically implementing net zero based on mission needs, consumption and existing resource constraints while still achieving existing sustainability mandates, the preferred alternative. No significant environmental effects were identified that cannot be mitigated to a level of insignificance with site-specific best management practices or other measures.

Assessments

A team of contractors completed energy assessments at the nine net-zero energy pilots. The energy assessments included three elements.

Acronyms and Abbreviations

FY	fiscal year
JB	Joint Base
ODASA-E&S	Office of the Deputy Assistant Secretary of the Army for Energy and Sustainability

They began with detailed analyses of energy consumption to quantify base loads, seasonal variation and effective energy costs. They included an evaluation of lighting, air temperature, ventilation, humidity and other conditions that affect energy performance and occupant comfort. The assessments culminated in identification of energy-efficiency measures, including no- and low-cost measures, modifications to system controls and building automation, operational changes and potential capital upgrades.

Water balances were completed at the eight net-zero water pilots. A water balance compares the total water supplied to the site to the actual water consumed at the equipment and process level.

This information provides historic installation water use trends and specific trends in water use at the building level. Water balances identify the largest water consumers and also can identify problem areas such as high leak rates.

An ODASA-E&S contractor conducted material flow analyses at six of the eight net-zero waste pilots. These analyses looked at: “outputs,” e.g., current recycling and waste disposal rates; “inputs,” e.g., purchasing data; by activity type, e.g., food service, housing, operations and maintenance, and motor pool operations. This examination allowed the pilot installations to link the volume of waste generated by activity with the source of that waste in the supply chain.

Road maps

ODASA-E&S took the results from the energy assessment, water balances and material flow analyses to prepare road maps for the pilots.

The net-zero energy road maps are complete. A key part of the net-zero energy road maps is the renewable energy assessments. The renewable energy assessment starts with a tools-based assessment to help identify renewable energy opportunities, including potential



Fort Riley, Kan., a net-zero water pilot, employs storm-water management techniques toward its net-zero goals. Photo courtesy of ODASA-E&S

technologies and project sites. The net-zero energy road maps contain specific projects, sequenced over several fiscal years, with the progress that each project will make toward net zero clearly identified.

Two of the eight net-zero water road maps are complete with the remaining road maps scheduled for completion by March. Within the net-zero water road maps, water efficiency and water reuse opportunities are evaluated against their life-cycle cost to identify projects that will have the greatest overall water demand reduction. The road maps will also contain specific projects, sequenced over several fiscal years, with emphasis on demand reduction and then on alternative water projects to replace the use of fresh-water resources.

One net-zero waste road map is under development. The remainder are planned for FY 2013. The net-zero waste road maps, while less formal than the project-specific energy or water road maps, will include reduction strategies and action plans for the priority waste streams identified in the material flow surveys. They will include improved purchasing practices, expanded repurposing and reuse strategies, additional waste streams targeted for recycling or composting, and potential energy recovery technologies.

Examples

All the pilots were actively working ➤

Army, EPA partner on net-zero initiative

by Marc Kodack and Ardra Morgan

In support of the Army's net-zero initiative, the Army and the Environmental Protection Agency's Office of Research and Development signed a memorandum of understanding in November 2011. The MOU draws upon EPA-ORD's leading-edge research to demonstrate and evaluate state-of-the-science technology to enhance the net-zero and sustainability goals at Army installations.

The Net Zero Initiative consists of 17 pilots in energy, water and solid waste. The pilots are located across the United States and overseas in different environmental settings. The installations represent several commands, including the Installation Management Command, Army Materiel Command, the Space and Missile Defense Command, the National Guard and the Reserves.

Under the MOU, the Army and EPA-ORD are working jointly to advance the development and demonstration of new applications and technologies that can be used on installations striving toward net-zero water, waste and energy goals.

The Army plans to explore technologies

and approaches that:

- increase efficiency and recovery of energy, water and materials;
- incorporate design and use of green infrastructure;
- address social and behavioural components of culture;
- aid in understanding of water, energy and material flows and interactions;
- incorporate water and energy security and climate-ready solutions; and
- include local communities as partners in efforts to change the way the Army has traditionally managed these critical resources so that the communities are part of the process and can take ownership of solutions.

Current efforts focus on two of the net-zero water pilots, Fort Riley, Kan., and Joint Base Lewis-McChord, Wash. EPA scientists and engineers are working with the Army, the Department of Energy's Pacific Northwest National Lab, the U.S. Army Corps of Engineers and other partners to identify installation technology needs and bring real solutions that will help shape the next generation of water, energy and waste management on Army installations. For example, at Fort Riley, areas of mutual interest that are being explored include water reuse, water quality, asset management and increasing water's



EPA personnel tour the Fort Riley drinking water plant in July as part of the EPA-Army partnership. Photo by Ardra Morgan

social value through education.

Over the next few months, project plans will be developed for research activities at Fort Riley and Joint Base Lewis-McChord to demonstrate technologies and approaches on these installations in support of achieving their long-term net-zero water goals.

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Marc Kodack is the Net-Zero Water Program manager, Office of the Deputy Assistant Secretary of the Army for Energy and Sustainability; Ardra Morgan is the senior advisor for sustainability and net zero, National Exposure Research Laboratory, EPA. 🌟

Acronyms and Abbreviations

MOU	memorandum of understanding
ORD	Office of Research and Development

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on their net-zero programs during the initiative's first year. Following are examples of their activities.

Fort Hunter Liggett, Calif., a net-zero energy pilot, followed the net-zero hierarchy by first reducing its energy demand by 40 percent, then developing renewable energy to offset the reduced energy demand. It constructed its first one-megawatt solar array, and a second one-megawatt array is in under construction.

Camp Rilea, part of the Oregon Army National Guard, is a net-zero water pilot. It reduced its fresh-water demand, offset

that reduced demand with gray-water reuse and improved its water security. Future efforts to further reduce their fresh-water demand will include additional water efficiency efforts and projects to increase gray-water reuse from 65 percent to 100 percent.

Joint Base Lewis-McChord, Wash., a net-zero waste pilot, is diverting or recycling 69 percent of its solid waste and 97 percent of its Military Construction-derived waste. The JB Lewis-McChord Commissary alone recycled more than 960 tons of food waste, cardboard, plastic and mixed paper in FY 2011, reducing the commissary's waste disposal costs by

nearly \$155,000. JB Lewis-McChord's concrete and asphalt recycling operations divert usable material from landfills and produce high-grade aggregate for other on-post projects at 50 percent below the cost of new aggregate.

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Wanda Johnsen is the Net-Zero Waste Program manager; Paul Volkman is the Net-Zero Energy Program manager; Kristine Kingery is the Net-Zero Program manager and director, Army Sustainability; and Marc Kodack is the Net-Zero Water Program manager; ODASA-E&S. 🌟

Joint Base Lewis-McChord hosts road-to-net-zero waste meeting

by Miriam Easley

How does a military installation get to a point where no waste is going to the landfill? That's what nearly 10 installations and various partners met to discuss July 24-26 at this year's Net Zero-Waste Progress Meeting held at Joint Base Lewis-McChord, Wash.

The Army's Net Zero Initiative — championed by Katherine Hammack, the assistant secretary of the Army for installations, energy and environment — includes 15 installations chosen as pilots to achieve net-zero energy, waste and water. JB Lewis-McChord was selected as a waste and a water pilot, and the installation leadership decided that, with JB Lewis-McChord's strong Energy program, the challenge of attaining net-zero energy could be taken on as well.

In addition, JB Lewis-McChord is developing two more net-zero goals: air and land. With the two last additions, JB Lewis-McChord will match the goals of its entire Installation Sustainability Program with the Army's Net Zero Initiative and again lead the way in sustainable planning and development.

In his opening remarks at the Net-Zero Waste Progress Meeting, Col. Thomas H. Brittain, then-JB Lewis-McChord commander, touched on the need for community engagement and partnerships to assist in becoming a net-zero installation.

"The partnerships will keep the momentum that we need to continue with this net-zero approach to how we take care of everyone who calls our military installations home," Brittain said.

Partnerships and engagement with the community were common threads throughout the three-day conference. All participants agreed these two things were important keys to reaching net zero by 2020, the challenge put forth by Hammack and her team.

Many installations have events to educate and get service members and Families involved. JB Lewis-McChord sponsors three each year: Earth Week in April, Public Lands Day in October and America Recycles in November. These bring out the Families for some low-cost and fun education while helping JB Lewis-McChord achieve net zero by 2020.

Involving children is important to preserving natural resources and retaining sustainable habits as they grow up. At the meeting, Hammack commented that children can also prompt adults to recycle.

"They can help remind us to be better stewards, and then they grow up to be those stewards," Hammack said. "We can raise future generations that can help us have a future that is not piled high with trash."

Partnerships have been vital to JB Lewis McChord's success in achieving net-zero waste. The installation diverts nearly 65 percent of its waste. Partners such as the Defense Commissary Agency, waste management contractor LeMay Inc. and the U.S. Army Corps of Engineers have helped advance the installation to this high waste diversion rate. For example, Janet Landon, Lewis Main Commissary manager and a recycling champion, and her team led the store to an 82 percent diversion rate and a savings of \$154,694 in waste disposal costs in 2011.

As installations seek to decrease waste disposal and increase diversion, finding solutions that are scalable to work both locally and Armywide and that can be tailored to fit

Acronyms and Abbreviations

JB	Joint Base
----	------------

the needs of military operations in theater are important, Hammack stressed.

"When you look at our mission in Afghanistan, we're looking at fuel as our biggest challenge — getting [fuel] into theater and moving it around," Hammack said. A significant portion of that fuel is going to fire incinerators that are burning trash.

Hammack related a conversation she had with a Soldier at a forward operating base about composting.

"Can you imagine that some combat Soldier would ever think about composting his garbage?" she asked the attendees. "But they're seeing that [garbage] is costing them in fuel, which is costing them in convoys, which is costing them in putting Soldiers at risk, because instead of doing their mission, they have to protect convoys. So, if we can help figure out some of these solutions and then take them into theater, it really is affecting mission."

Hammack also pointed out that the Net-Zero Initiative isn't only about saving the environment, it's also good business practice and helps make the military better.

"One of the great things about every net-zero program we have is it is focused on reducing requirements, reducing risk, reducing vulnerabilities, improving the mission and, in many cases, reducing costs," she said. "It's fully supported by [Army leadership], because they understand the value that this brings to the Army mission; they recognize that it's the right thing to do."

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Miriam Easley is the contractor sustainability outreach coordinator, Environmental Division, Directorate of Public Works, JB Lewis-McChord.





Energy Operations Order overview

by Qaiser Toor

Reliable access to affordable, stable energy supplies is a significant challenge for the Army and the nation. The Army relies on energy, and disruption of critical power and fuel supplies would harm the Army's ability to accomplish its missions. The scarcity of low-cost energy poses a risk and exposes a vulnerability that must be addressed by a more secure energy position and outlook.

To address these energy security challenges, the Secretary of the Army issued the *Army Energy Security Implementation Strategy* with its five strategic energy goals:

- reduced energy consumption,
- increased energy efficiency across platforms and facilities,
- increased use of renewable and alternative energy,
- assured access to sufficient energy supplies, and
- reduced adverse impacts on the environment.

These goals incorporate the fundamental principle that the improvements achieved will not lead to reductions in operational capability or the ability to carry out primary missions.

Installation Management Campaign Plan

The Installation Management Command is implementing the *Installation Management Campaign Plan*, which includes a Line of Effort focused on energy to address the overall Army energy security strategy. The intent of the Energy Line of Effort is to maintain energy- and water-efficient installations by holding users accountable, modernizing facilities, installing new technologies and leveraging partnerships that will provide an increased level of energy security leading to sustainable and resilient infrastructure and mission assurance.

IMCOM Energy Operations Order

IMCOM issued OPOD 10-257,



Qaiser Toor
Photo by Mary Beth Thompson

which directs specific actions and energy- and water-conservation measures. The OPOD directs IMCOM garrisons to implement a Garrison Energy and Water Management Program that includes the following actions:

- Appoint in writing full-time garrison energy managers and input contact information in the Army Energy and Water Reporting System. Garrison commanders must ensure their energy managers are knowledgeable and trained.
- Include energy and water conservation responsibilities in position descriptions of commanders, directors and other key positions that impact energy management to ensure compliance with federal legislation, executive orders, the *Army Energy Security Implementation Strategy* and the campaign plan.
- Establish a quarterly garrison energy steering committee composed of energy managers and garrison organizations or units to review energy and water consumption activities, evaluate goals and objectives and develop improvement strategies.
- Implement Building Energy Monitor and Unit Energy Conservation Officer programs. Examples are at <https://www.us.army.mil/suite/doc/37783311>.
- Provide at least quarterly energy training and awareness for installation and community personnel. Take advantage of opportunities to promote energy conservation awareness through command

Acronyms and Abbreviations	
FRAGO	Fragmentary Order
IMCOM	Installation Management Command
OPOD	Operational Order

channels and community activities during annual Energy Awareness Month and Earth Week.

- Develop an energy security plan and update plans annually based on reviews with local utility suppliers. A sample template is at <https://www.us.army.mil/suite/doc/37783322>.
- Enter accurate energy data monthly and water data quarterly into the Army Energy and Water Reporting System, and conduct monthly quality-control checks. Provide a quarterly certification of data completeness to the region energy manager.
- Submit a complete annual energy report each October.
- Nominate worthy projects, individuals and teams for *Secretary of the Army Energy* and *Federal Energy Management Energy and Water Conservation* awards.
- Review all new construction and repair project plans and specifications for compliance with appropriate energy policies. Projects must include life-cycle cost-effective energy- and water-conservation measures.
- Ensure new construction and major repair and renovation greater than \$7.5 million incorporate sustainable design principles to achieve a minimum of Leadership in Energy and Environmental Design Silver certification.
- Ensure designs reduce energy consumption by 30 percent below the levels established by the American Society of Heating, Refrigeration and Air Conditioning Engineers Standard 90.1.
- Perform annual energy audits of at least 25 percent of the total square feet of garrison facilities to evaluate energy usage and determine the best locations to incorporate energy savings measures. Energy audit guidance can be found ➤



5 tactics for better energy and utility project submittals

by Steve Tallman

Armywide funding for the Sustainment, Restoration and Modernization management decision package for energy efficiency and utilities modernization projects, known as the QUTM, for the fiscals 2012-16 Program Objective Memorandum was \$720 million. This amount has been increased to \$1.3 billion for POM 2013-17.

This change is good news for garrisons working to implement energy-efficiency projects and repair aged infrastructure. However, with the increased funding have come increased requirements for project justification.

Garrisons can expect this year's validation of Army Energy Program requirements to focus heavily on project-level data. A lot of detail is likely to be needed to convince Headquarters Department of the Army planners, programmers and resource managers of the validity of the budget requirements for QUTM projects.

Last year, Army Budget Office cost analysts conducted several teleconferences



Steve Tallman
Photo by Rami Tallman

with installation program managers to validate QUTM project requirements, and they will want to scrutinize requirements even more this year. Budget planners are continuously looking for "loose" funds to trim and use to plus-up other accounts, and so garrisons need to tell the story of the real benefits they realize from the recent increases in funding for energy and utilities infrastructure.

To that end, here are five important ways to ensure solid energy and utilities project submittals.

Acronyms and Abbreviations	
ECM	energy conservation measure
FY	fiscal year
HQDA	Headquarters Department of the Army
IMCOM	Installation Management Command
LCCA	life-cycle cost analysis
POM	Program Objective Memorandum
PPS	Project Prioritization System
ROI	return on investment
QUTM	SRM management decision package for energy efficiency and utilities modernization
SRM	Sustainment, Restoration and Modernization

Energy and utility project funding strategy

Become familiar with the strategy driving Installation Management Command's energy and utilities funding efforts. IMCOM's strategy focuses on return on investment and initially targets low-cost and no-cost projects for funding to buy out these projects at all garrisons, and then focuses on projects with less than a 10-year payback.

Low-cost and no-cost energy conservation measures are initiatives such as replacing incandescent bulbs

(continued from previous page)

in the Department of Defense Energy Manager's Handbook at <http://www.wbdg.org/ccb/DOD/DOD4/dodemhb.pdf>.

- Implement all no-cost and low-cost measures as detailed in <https://www.us.army.mil/suite/files/27069981>.
- Implement energy and water saving projects that have a simple payback of 10 years or less.
- Use alternate funding sources such as Energy Savings Performance Contracts, Utility Energy Services Contracts and the Energy Conservation Investment Program to help fund at least one project that cannot be self-funded annually.
- Reduce vehicle fleet petroleum use 30 percent by 2020 using 2005 as the base year, as required by Executive Order 13514, *Federal Leadership in Envi-*

ronmental, Energy and Economic Performance. Garrisons should develop a petroleum fuel reduction strategy that includes replacing fossil fuel vehicles with alternative fuel vehicles and electric vehicles, maximizing use of mass transit and shuttle buses, and installing alternative or renewable refueling infrastructure to encourage alternative and electric vehicle use.

Current status

IMCOM garrisons are required to report semiannually their level of compliance with the action items identified in the Energy OPORD. The latest status was collected under Fragmentary Order 01 and resulted in an IMCOM-wide average level of compliance of 67 percent for Energy Action Plan action items and 62 percent

for No-Cost/Low-Cost action items. The FRAGO 01 results for individual garrisons are at <https://www.us.army.mil/suite/files/34615193>.

The next round of updates is being collected under FRAGO 02 and will reflect garrison compliance as of September. Results will be updated semiannually and published in a scorecard for each garrison, along with its performance in meeting energy intensity reduction goals. The scorecard will be distributed to IMCOM garrison commanders and senior commanders.

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with CFLs or LED lamps, installing programmable thermostats and replacing weather stripping. A complete list of low-cost and no-cost ECMs is available at <https://www.us.army.mil/suite/doc/27288416>.

Projects to repair and modernize utilities infrastructure are also included, with higher priority given to aged and failing infrastructure systems that have Installation Status Report ratings of Q3 and Q4 and solid project justifications.

See page 10 of the September/October 2011 Public Works Digest for more on the strategy for funding energy and utility projects. It can be found at http://www.imcom.army.mil/Portals/0/hq/about/publications/pwd_digest/PWD-SeptOct11WEB.pdf.

Project Prioritization System

Input projects into the IMCOM PPS at <http://pps.hqda.pentagon.mil/>. IMCOM moved away from the spreadsheet method of project programming data collection and now requires all projects to be entered into PPS.

Each project must have a project number and a PPS ID number. Garrisons must specify a garrison priority, and regions must specify a region priority using the “Special

Program Leaders Priority” field.

Life-cycle cost analysis

Provide a complete LCCA, and be sure to upload the LCCA documentation into the PPS using the upload feature. Projects without accompanying LCCA documents will receive low priority.

Because of the emphasis on project cost-effectiveness, it is crucial that an LCCA be performed for each project submitted for QUTM funding. The LCCA process is fairly constrained as required by Executive Order 13123. See http://www1.eere.energy.gov/femp/pdfs/lcc_guide_05.pdf for guidance on performing LCCAs.

Work classification

Understand the color of the money you are working with. Unlike Military Construction or Energy Conservation Investment Program funding, QUTM funds are SRM funds.

These funds are subject to SRM funding rules, which limit new construction to \$750,000. Repair projects are unlimited; however, all projects must conform to work classification standards and local approval authorities.

If the repair-to-replacement value of the project exceeds 50 percent, an SRM DD Form 1391 must be submitted through


the appropriate approval chain. Such repair projects that exceed \$5 million must obtain approval from HQDA through Headquarters IMCOM, and if they exceed \$7.5 million, a 14-day congressional notification period is mandatory, so plan accordingly to be able to execute projects prior to the end of the fiscal year.

Business rules

Energy and utilities projects financed with QUTM funds must follow the PPS Business Rules for Investment Category Code IFG10. Take the time to read through these rules, which provide answers to many common questions, offer helpful links to more resources and outline lessons learned from previous FY programs. An LCCA template is also included as well as guidance on eligible and ineligible project types.

The business rules are available on the PPS website under the “Help” tab: https://securewebako.hqda.pentagon.mil/cac/pps/PPSHelp/BusinessRules/2012Rules/8._ENERGY_AND_UTILITIES_BUSINESS_RULES.doc.

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Army Funding Position for QUTM
POM 2013-17 vs. POM 2012-16

POM 2012-16	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2012-16
Requirement	\$372,339	\$386,179	\$397,275	\$392,475	\$368,159	\$1,916,427
Funded	\$120,000	\$120,000	\$140,000	\$160,000	\$180,000	\$720,000
Reasons not fully supported in POM 2012-16:						
- No detailed project list						
- No business case						
- No clear return on investment						
POM 2013-17	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2013-17
Requirement	\$702,659	\$711,962	\$725,390	\$722,390	\$722,583	\$3,585,467
Funded	\$342,878	\$343,990	\$158,880	\$178,506	\$281,541	\$1,305,795
Reasons not fully supported in POM 2013-17:						
- No clear energy ROI in DD Form 1391						
- Business case completed, but not fully supported						
- ROI not well defined or supported						

Source: Army Energy Managers Training Workshop, 2011



Putting energy and water into the Army Campaign Plan

by Cecile Holloway

Army Campaign Plan Objective 8-0, Achieve Energy Security and Sustainability Objectives, was added to ACP 2012 by the secretary of the Army to clearly address energy security. This campaign objective's strategic outcomes are assured access to reliable energy supplies and the ability to protect and deliver sufficient energy to meet mission-essential requirements. Energy and sustainability cut across the entire Army enterprise and generate an impact at the core campaign objectives.

Campaign Objective 8-0 has four major objectives that particularly affect installations and operational energy objectives:

- **MO 8-1, Adapt or execute installation energy security and sustainability strategies**, assigned to the Office of the Assistant Chief of Staff for Installation Management, includes installation energy reduction and efficiency, nontactical vehicle fuels and greenhouse gas emissions.
- **MO 8-2, Achieve energy-informed operations**, assigned to Army G-4, focuses on operational energy that will enhance the Army's abilities to accomplish its core missions and integrate energy into technical and operational analyses.
- **MO 8-3, Enhance water security**, assigned to the assistant secretary of the Army for installations, energy and environment, seeks assured availability of water for all Army missions.
- **MO 8-4, Integrate and advance sustainability across the entire life cycle**

Acronyms and Abbreviations	
ACP	Army Campaign Plan
ASA-IEE	assistant secretary of the Army for installation, energy and environment
MDMS	Meter Data Management System
MO	Major Objective
OACSIM	Office of Assistant Chief of Staff for Installation Management
SMS	Strategic Management System

of the Civil Works portfolio, assigned to the assistant secretary of the Army for civil works, marks the first time that the U.S. Army Corps of Engineers' Civil Works program has led a major ACP objective.

Katherine Hammack, ASA-IEE, personally reviewed metrics assessments with the other MO owners' leadership. Over the last six months, MO owners and subject matter experts have developed candidate metrics to measure performance relative to the objectives; assign weighting; set targets, criteria and trends; and determine reporting frequency.

As the MO 8-1 owner, OACSIM established six subtasks to measure the installations' energy security performances using the Office of Management and Budget's Sustainability and Energy Scorecard. The scorecard focuses on energy, water and petroleum consumption reduction and on greenhouse gas emissions reduction through climate change adaptation. Metrics performance will be tracked and reported in the Strategic Management System that will align with the annual reporting requirements of the Office of the Secretary of Defense, the Office of Management and Budget and Congress.

MO 8-3 defines water security as the capacity to ensure that water of suitable quality is provided at a sustained rate sufficient to support all current and future Army missions. Performance measurement

Major Objective 8-1: Adapt/Execute Installation Energy Security and Sustainability Strategies	
Subtasks	Candidate Metrics
8-1.1 Reduce Energy Intensity of Goal-Subject Facilities on Permanent Installations	8-1.1.1 Percentage Reduction in Energy Intensity, Measured in British Thermal Units per Gross Square Foot
8-1.2 Increase Use of Renewable and Alternative Energy Sources	8-1.2.1 Percentage of Army Total Energy Consumed from Renewable / Alternative Sources
8-1.3 Reduce Nontactical Vehicle Petroleum Use	8-1.3.1 Percentage Reduction in Petroleum Use, Measured in Gasoline Gallons Equivalent 8-1.3.2 Percentage Increase in Consumption of Alternative Fuels
8-1.4 Reduce Greenhouse Gas Emissions	8-1.4.1 Percentage Reduction in Scope 1 and 2 GHG Emissions, Measured in Metric Tons of Carbon Dioxide Equivalent
8-1.5 Achieve Energy Evaluations on 25 percent of Covered (required) Facilities Annually	8-1.5.1 Percentage of Covered Facility Square Footage that Completed Energy Evaluations
8-1.6 Implement Facilities Metering to Improve Energy Management	8-1.6.1 Percentage of Total Electric Meters Installed on Appropriate Facilities and Reporting to MDMS Compared to Total Scheduled

This table lists MO 8-1 metrics in SMS that track annual performance as required by statutes and executive orders. Charts courtesy of Cecile Holloway

Major Objective 8-3: Enhance Water Security	
Subtasks	Candidate Metrics
8-3.1 Expand use of technology to increase water efficiency	8-3.1.2 Percentage of Covered Facility Square Footage that Completed Water Evaluations 8-3.1.3 Percentage of Total Water Meters Installed on Appropriate Facilities and Reporting to MDMS vs. Total Scheduled
8-3.2 Reduce Direct Consumptive and Withdrawal Use	8-3.2.1 Percentage Reduction in Potable Water Intensity, Measured in Gallons per Gross Square Foot (Gal/GSF)

This list of metrics from SMS tracks the performance of MO 8.3.

criteria are being developed with emphasis on technology to increase water efficiency including leak-detection systems, water consumption and withdrawal reductions, alternative water use increases and contingency basing water reuse systems.

OACSIM is involved with three MO 8-3 metrics that deal with the requirements of Executive Orders 13423 and 13514 regarding water evaluations in covered facilities, water intensity reduction and water meter installation on appropriate facilities.

Since 8.0 is a new campaign objective, continuous coordination among owners will improve the tracking of performance measures and identify strategic metrics that will help senior leaders make informed decisions about where resources should be directed.

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Army central meter program: 3 steps to success

by Jesse Marzette III

Now that advanced metering is a fact of life on Army garrisons, Directorates of Public Works need to know the best way how and where to make advanced meter installations happen. Three easy steps will move DPWs to the advanced metering finish line.

History

The *Army Metering Implementation Strategy* was originally developed in response to the Energy Policy Act of 2005, which required all federal facilities to be fitted with advanced meters for electrical consumption by Oct. 1, 2012, where economically practicable. The Energy Independence and Security Act of 2007 established a fiscal 2016 deadline for metering all utilities, including natural gas and steam, serving federal facilities.

To meet these requirements and related Department of Defense guidelines, the Office of the Assistant Chief of Staff for Installation Management and Installation Management Command assigned the U.S. Army Engineering and Support Center, Huntsville, Ala., to plan and execute an Army Meter Program across all garrisons and centers for active Army, Army Reserve and National Guard regions.

Goals

Installation of advanced electric, water, gas and steam meters will result in the direct measurement of 65 percent of the total energy consumed by Army facilities. The facilities selected for metering under



Jesse Marzette
Photo by Neal Snyder

the centrally funded metering program are those that are economically justified according to Department of Energy and Office of the Secretary of Defense guidance.

Advanced electric meter data is reported hourly. Advanced mechanical — natural gas, water and steam — meters report data daily.

In addition to the AMP metering, 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 is to be coordinated with Huntsville Center to prevent duplication of the metering being done by the centrally funded program and compliance with network security requirements for meter data communications.

Scope

The AMP has responsibilities over and above the actual installation of the meters. These include:

- managing the system security information assurance accreditations of the AMP hardware and software configurations;
- ensuring all Army metering systems put in by others — such as by Energy Savings Performance Contracts, the Energy Conservation Investment Program, Energy Monitoring and Control Systems, Utility Energy Services Contracting, Utilities Privatization, Military Con-

Acronyms and Abbreviations	
AMP	Army Meter Program
DPW	Directorate of Public Works
EKO	Engineer Knowledge Online
FY	fiscal year
Huntsville Center	U.S. Army Engineering and Support Center, Huntsville
IMCOM	Installation Management Command

struction, sustainment projects or tenants — meet the AMP technical and system security requirements; and

- providing life cycle support for Army metering systems, including providing a help desk.

These responsibilities are managed through a configuration management process. Information about the process and other AMP reference information can be found on the AMP website under Engineering Knowledge Online virtual teams.

3 Steps

1. Install advanced electrical meter systems. The vast majority — more than 9,500 — of continental U.S. advanced electrical meters have been installed. The remaining meters — inside and outside the continental United States — will be installed and reporting to the building point of connection by September 2013.

2. Obtain advanced meter connectivity. Interim authority to operate has been issued for four of the six meter system configurations. After the system components — advanced meter head-in servers, building point of connection and advanced electric meters — are tested at the U.S. Army Information System Engineering Command laboratory, authority to operate will be requested, which will allow use of the approved system configurations servers and stimulate their rapid deployment to the garrisons

Garrison-specific teleconferences are held weekly to prepare for the system configuration advanced meter head-in servers installation. Each installation



An advanced meter measures natural gas usage at Fort Hood, Texas. Photo courtesy of AMP



Commercial Utilities Program update

by Ernesto Ortiz

The Commercial Utilities Program is designed to be an integral and essential element of the Army. The program identifies ways to reduce utility services by intervening in rate case increases, performing site visits, conducting installation utility rate surveys and performing utility contract management oversight.

The CUP is the center of expertise for utility rate intervention support, installation utility rate reviews, tenant reimbursement oversight and the conversion of tariff-based utility rate arrangements to special utility contracts.

Installation Management Command, in coordination with the Corps of Engineers, has used the CUP to maximize energy cost savings since early 2004. The CUP's major benefits to the Army are the substantial energy costs avoidance, attained through minimizing cost increases, and energy cost savings, achieved through utility costs reduction.

In fiscal 2012, CUP was funded for \$250,000.00 to study existing utility provider services and garrison utility contracts, to identify cost saving opportunities and to make recommendations. The CUP studies' outcome identified these cost-saving opportunities:

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will have a site-specific install plan that will include shipping and installation instructions. An updated deployment schedule can be found on the AMP website on EKO.

3. Install other advanced utility meters. This effort will begin in FY 2013 and continue through FY 2018, as funding is available.

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- At Fort Huachuca, Ariz., where a four-year settlement agreement was about to expire, early negotiations allowed for cost reduction.
- At the U.S. Military Academy, West Point, N.Y., which is in a deregulated state, opportunities were found to change utility providers and negotiate rate classes.
- At Aberdeen Proving Ground, Md., a number of tenants that were not reimbursing the installation for their energy consumption were identified.
- At Fort Hood, Texas, several opportunities to conserve energy were located with emphasis placed on adjusting the installation's power factor as a major cost saver.

Previous garrison studies have identified billing errors, late fees, rate increases and incorrect rate classes among other utility discrepancies. CUP has found discrepancies and inequalities at garrisons lacking utility expertise and personnel. The program is a tool that can increase the garrison's ability to identify, negotiate and change providers to reduce its energy consumption cost.

Garrisons that have used CUP report that they like its results. Because of its positive outcomes, CUP is being improved, including increased staff training and Army Regulatory Law Office coordination, and the programming of \$550,000 to increase the number of CUP sites to 10 in FY 2013. Headquarters IMCOM is prioritizing targeted garrisons to maximize their energy cost

Acronyms and Abbreviations	
CUP	Commercial Utilities Program
FY	fiscal year
IMCOM	Installation Management Command

savings opportunities.

The Army's ability to execute projects quickly is hampered by lack of funds. This situation, together with the ongoing instability of commodity prices, creates a challenge that is difficult to overcome and makes it hard to take advantage of savings opportunities. As a result, implementation of energy savings and cost avoidance opportunities identified through CUP require timely response to capture those savings.

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DESCRIPTION	UNIT	PRICE	AMOUNT
RFP ADMINISTRATIVE CHARGE			\$10.00
RFP BASE CHARGE CALCULATIONS:			
BASED FACILITIES CHARGE			\$10.00
SERVICE PERIOD - JANU THROUGH SEPTEMBER			
CSL ON-PEAK KW	11,181.141	0.2487	2,782.179
CSL OFF-PEAK KW	21,859.00	0.2487	5,436.279
CSL ON-PEAK KW (CONTRACT)	28,820.00		7,197.120
CSL ON-PEAK KW BILLING (FIRST 5,000 KW)	5,000.00	16.00	80,000.000
CSL ON-PEAK KW BILLING (NEXT 5,000 KW)	5,000.00	16.00	80,000.000
CSL ON-PEAK KW BILLING (OVER 10,000 KW)	18,820.00	17.00	320,940.000
CSL OFF-PEAK KW (CONTRACT)	28,747.00		71,882.370
CSL OFF-PEAK EXCESS KW BILLING	1.00		0.000
SERVICE PERIOD - OCTOBER THROUGH MAR			
CSL ON-PEAK KW	2,183.00	0.2487	542.124
CSL OFF-PEAK KW	4,725.00	0.2487	1,175.487
CSL ON-PEAK KW (CONTRACT)	54,842.00		13,837.000
CSL ON-PEAK KW BILLING (FIRST 5,000 KW)	5,000.00	16.00	80,000.000
CSL ON-PEAK KW BILLING (NEXT 5,000 KW)	5,000.00	16.00	80,000.000
CSL ON-PEAK KW BILLING (OVER 10,000 KW)	44,842.00	17.00	762,314.000
CSL OFF-PEAK KW (CONTRACT)	54,874.00		13,647.330
CSL OFF-PEAK EXCESS KW BILLING	26,875.00	1.00	26,875.000
TOTAL RFP BASE CHARGE			3,065,074.18
POWER FACTOR ADJUSTMENT			0.000
RFP HOURLY ENERGY CHARGE ADJUSTMENT			448,810.32
FACILITIES DEMAND CHARGE (REDUCED PEAK KW OR KWICKS - MAX REDUCED CSL KW) X (CHARGE)			40,996.70
DISBURSE ADJUSTMENT (DISBURSEMENT (Range X DISBURSE RATE))			22,223.24
DISBURSE OPT-OUT CREDIT (2014 KW X DISBURSE RATE)			22,223.24
SUB-TOTAL			3,538,877.37
OTHER (20 PLAN)			0.000
FACILITY CHARGE (MILITARY VILLAGE HOUSING)			0.000
FACILITY CHARGE			55,885.00
RFP ADJUSTMENT			28.00
TOTAL			3,594,790.37

One garrison's utility bill shows a \$71,882.37 monthly credit after CUP managers advised it to challenge a fee for electric demand improvements, which the installation had already made on its own. Graphic courtesy of Ernesto Ortiz



Utility privatization 101

by Ismael Meléndez

Army utility privatization is the sale of government-owned, on-post utility distribution systems to a private entity that will own, operate and maintain the systems on military installations. The strategy's main purpose is to allow the Army to focus on core defense missions and functions by relieving it of those installation management activities that can be done more efficiently and effectively by the private sector.

Distinguishing the term *privatization* from *contracting out* and *outsourcing* is important. For the UP initiative, the Army is selling on-post utility infrastructure distribution systems to private entities. The contractor acquiring these systems will own the infrastructure and will be responsible for its operation and maintenance. The Army will not retain ownership of the systems nor will it contract out their O&M to private entities. The systems are being sold outright.

The National Defense Authorization Act for fiscal 2012 makes clear that the House of Representatives Armed Services Committee believes the Department of

Defense should more aggressively and effectively implement UP as part of its asset management strategy to allow each military service to focus on core defense missions and functions. The committee further explains that UP can improve energy and water efficiencies and improve installation infrastructure in a cost-effective manner for the long-term benefit of military members and their Families.

The NDAA for FY 2012 made legislative modifications to the UP conveyance authority found in 10 U.S. Code Section 2688. The modification delegates the discretionary authority to the service secretary to determine where privatization is in the best interests of the United States.

Although 10 U.S. Code Section 2688 defined utilities as electric, water, wastewater, natural gas, steam, hot and chilled water, and telecommunications distribution systems, the Army is focusing its UP effort on electric, water, wastewater and natural gas distribution systems only.

The term *utility systems* refers to utility infrastructure — wires, pipes, mains,

Acronyms and Abbreviations	
FY	fiscal year
IMCOM	Installation Management Command
NDAA	National Defense Authorization Act
O&M	operation and maintenance
UP	utility privatization

switching stations and transformers. Basically, utility systems involve the infrastructure that connects the installation to the off-post commodity supplier and connects the various buildings on the installation. It does not include wiring, piping inside buildings and utility commodities provided to the installation.

The request for proposal development and the economic analysis for UP life-cycle cost analysis require certain information. Examples are:

- utility distribution system maps, i.e., GIS or AutoCAD with approximate age of facilities, utility system graphic diagrams and schematics for existing and planned facilities including a summary of utility systems activities over the last three years;
- information on environmental audits, impact statements with analysis related to the utility system;
- copies of planned capital expenditure projects associated with the utility system and of planned utility construction and maintenance activities for the next five years;
- detailed and accurate real property records describing initial cost and dates of installation or operation for all utility facilities;
- preparations and programming for post-award contract management and man-power resources necessary and available to ensure contract administration and quality performance;
- an adjustment or modification to an A-76 contract, if applicable, to eliminate requirements integral to the utility service contract for O&M of the privatized system and any service or construction contract supporting, or planned to

FY12-13 Scheduled			FY13-14 Scheduled		
Installation	System	Award FY13 Qtr	Installation	System	Award FY14 Qtr
Picatinny Arsenal	W/WW	Q1	Fort Polk	G	Q1
Fort Hood	E/G	Q2	JBLM	E/W/WW	Q2
APG	W/WW	Q2	Fort Cambell	E	Q2
Henderson Hall (Ft Myers)	E	Q3	Oahu	E	Q2
Gillen Enclave	E/G/WW/WW	Q3	Fort Jackson	E/G	Q3
			White Sand	E/G/W/WW	Q3
FY14-15 Scheduled			FY15-16 Scheduled		
Installation	System	Award FY15 Qtr	Installation	System	Award FY16 Qtr
Fort Leonard Wood	W/WW	Q2	Redstone Arsenal	E/G/W	Q2
			Fort McNair	W/WW	Q3
			Fort Myers	W/WW	Q3
FY16-17 Scheduled			FY17-18 Scheduled		
Installation	System	Award FY17 Qtr	Installation	System	Award FY18 Qtr
West Point	W/WW	Q1	Fort Drum	E/G	Q1
Yuma PG	E/W/WW	Q2	Fort Riley	E/G/W/WW	Q2
Fort Drum	W/WW	Q3	Fort Carson	E/G/W/WW	Q3

This chart lists the approved FY 2013–18 UP program for IMCOM installations. Chart courtesy of Ismael Meléndez



Energy awareness and conservation assessments find quick fixes

by Ralph Totorica

Each year, 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-saving 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 building inventory each year. In the past, 10 to 12 assessments were conducted per year, but the program was expanded in fiscal 2012 to 18 to 24 assessments per year. Headquarters IMCOM's goal is to get each garrison on a

four-year rotating cycle.

The assessment consists of a one-week site visit by an IMCOM representative and an energy consultant under contract for technical support. The week starts with introductory meetings with the garrison commander and director of Public Works.

After 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 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.

In addition to identifying specific energy conservation measures, the assessment offers a great opportunity for energy managers to increase


Acronyms and Abbreviations

DPW	Directorate of Public Works
IMCOM	Installation Management Command

energy awareness through the Public Affairs Office. The energy awareness and conservation assessment concludes with an out-brief to the garrison commander and the 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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During assessments, inspectors look for easily fixable energy wasters like exterior lighting of buildings and grounds during daytime hours. Photos courtesy of Sain Engineering Associates



Improper heating and cooling thermostat set points are energy wasters noted by inspectors during assessments.

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support, utility systems.


When a utility system is privatized, programming and funding streams change. Before privatization, requirements for government-owned systems are programmed and funded through facility Sustainment, Restoration and

Modernization programs.

Once the system is privatized, all O&M and recapitalization requirements are provided by the privatization contractor and programmed and funded as a utility requirement through Base Operations Support funding. O&M costs are validated and funded directly by garrisons. Headquarters Installation Management

Command centrally manages resources and validates initial capital improvement and capital improvement projects.

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Smart meters: friend or foe?

by Alicia Allen

The use of smart meters to transmit power usage data from homes to utility companies has raised concerns ranging from fire safety and health to invasion of privacy, resulting in negative articles, blogs and websites.

“Directorates of Public Works on U.S. Army installations shouldn’t be concerned,” said David Purcell, chief, Energy and Utilities Branch, Office of the Assistant Chief of Staff for Installation Management. “The meters the U.S. Army Corps of Engineers is purchasing and the methods used in installing them are safe, reliable and not subject to the failures reported in Maryland, Illinois and other places.”

A smart meter, or advanced meter, is a device that uses software to communicate meter data to a computer, rather than having someone come to the meter and manually read and collect the data. Smart meters are a key tool in managing energy use. Although perceived as controversial by some, smart meters do not provide safety or health risks for military and Civilians who work in Army facilities.

The advantages of having the meter data sent to a computer are numerous. Data can be collected more frequently, allowing the installation to view usage over time, indicating such trends as the timing of peak use and comparing use over time. Another advantage is the cost savings gained by avoiding the labor to read each meter visually. Smart meters provide two-way communication, and they can be a conduit for controlling devices and systems that use electrical energy.

Smart meter data can be transmitted over installation networks consisting of copper wires, fiber-optic cables or even through the air using the same technology as cordless phones, baby monitors and Wi-Fi computer routers found in homes and cell phones. The mechanism for transmitting wirelessly is via radio frequency emissions.

Controversy surrounding smart meters



Alicia Allen
Photo by James Campbell

usually relates to wireless transmission of meter data from a smart meter installed on homes by the local utility company. Fear of big brother privacy invasion, fear of being used as a guinea pig by big business and fear of the unknown have driven concerns, if review of the negative articles, blogs and websites are an indication of citizen perspectives. These fears are behind many negative reports focusing on the risk of fires and health issues attributed to smart meters’ RF emissions.

Fires have been reported in a small number of smart meters installed by local utilities. These can generally be attributed to installation on aging and corroded wiring in personal dwellings, the improper smart meter installation and, rarely, a malfunction due to a manufacturing defect. These conditions do not exist on meters installed by the Army Meter Program.

Health issues are most often reported by individuals who also express frustration with the lack of control over whether smart meters are installed on their residences. A small number of individuals report sensitivity that developed from cumulative or threshold exposure to RF technology, but, according to a World Health Organization study in 2005, tests suggest that, “‘electromagnetic hypersensitivity’ is unrelated to the presence of electromagnetic fields.”

The California Council on Science and Technology reported widely available research that indicates using a cell phone

Acronyms and Abbreviations	
AMP	Army Meter Program
DPW	Directorate of Public Works
RF	radio frequency

or a cordless phone causes more exposure than being a few feet away from a wireless smart meter. According to the study, standing next to a microwave also causes more exposure than a wireless smart meter at about the same distance. A report by the Institute of Electrical and Electronics Engineers’ Committee on Man and Radiation identifies flaws with multiple studies, papers and articles that purport smart meters can cause health issues.

These reputable studies should assure the DPW that there is no health risk from installing the advanced meters on government facilities.

“First and foremost, the Army Meter Program uses advanced meters, not smart meters, as the standard for electrical metering of Army facilities and operations,” said Will White, technical deputy, Mandatory Center of Expertise for Utility Monitoring and Control Systems. “This distinction means that the meters submit meter data upward, but control commands do not flow downward to the meter.

“The Federal Energy Management Program defines an advanced meter as a meter that can report in 15-minute intervals and report upward at least once every 24 hours,” White continued, “Because the term smart meter is often used interchangeably with the term advanced meter to refer to meters that can report meter data, it has created confusion about the differences between the two.”

Second, wireless data transmission from AMP-installed meters is the exception, not the rule, White said. Buildings that do not have connectivity to an existing network are considered for connection only after an analysis is done to evaluate the cost and benefits of alternatives for wired connection, wireless connection or to remain unconnected. Critical buildings, ➤



Environmental Management Systems Qs and As

by Martin Roberts and Bobby McGough

Eleven years ago, Army leadership recognized standardized environmental management as a good business practice. A 2001 decision added elements of the International Organization for Standardization 14001 Environmental Management Systems standard to the existing environmental management structure. A number of intermediate milestones drove the Army to full implementation by Dec. 31, 2009. All installations declared success.

Why are some Army installations still having problems with effective and proper EMS use? Some installations lost their way, changing their EMS approach from “how the Army manages environmental programs” to “an environmental program to be managed.” At many installations, EMS was incorrectly identified as just another program that adds to overhead costs. In addition, the prolonged implementation period may have inadvertently given installations a sense that EMS was not an Army emphasis.

What are installations to do? For the most, they are already doing it. Military organizations’ natural management processes match up nicely with the EMS structure, so lines just have to be drawn connecting them. Army EMS’s should also be *mission oriented*, supporting the Army Triple-Bottom-Line of mission, environment and community, while

focusing on *continual improvement* and *pollution prevention*.

Who should be running the EMS?

An EMS is normally managed by the environmental office, but because environmental issues touch almost every operation — fuels, oils, paints, storm water, erosion, as examples, everyone working on the installation plays a role too. Many projects with environmental impacts may be better run out of the Directorate of Plans, Training, Mobilization and Security or the Plans, Analysis and Integration Office. Who manages specific parts of an EMS is not as important as the commitment and support of leaders who can talk across various organizational levels and effect change.

What are the main points to know about an EMS? EMS is not a contained program operating in a box by itself. It’s not a program at all; *it’s a way of doing business*. It’s how you manage your programs. Having Environmental Quality Control Committee meetings, performance objectives for employees, project planning and prioritized resources and projects are all critical pieces of a functional EMS.

Managing the EMS is *not* a job for one person full time. It may have taken one person’s concerted effort to get it rolling, but now it should take just a small part of everyone’s time. Instead of each program manager doing things his or her own way, in essence creating individual

Acronyms and Abbreviations	
EMS	environmental management system
ISO	International Organization for Standardization
SOP	standard operating procedure

management systems, EMS guides the way programmatic functions are executed — kind of a plug-and-play system. Your installation-specific, EMS will determine a uniform way of managing document controls, records and operational controls such as standard operating procedures and permits.

EMS is not static and has no end point. Goals can be adjusted midstream. New goals that better fit the current circumstances can replace old goals that have been met or have become obsolete.

How does an installation ensure successful execution? The No. 1 factor that determines the long-term success of an Army EMS is engagement by the garrison or installation commander, one of the elements of an ISO 14001 EMS. Also extremely important is effective and frequent communication between the shop level and program managers.

Finally, installationwide participation is a must. Translating the technical language associated with EMS for appropriate functions and levels throughout the installation and having specific EMS-related functions customized into a short SOP are often helpful. The latter

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i.e., major electricity users that have the potential for significant savings, might be approved for wireless transmission if no other option is available or acceptable. However, the vast majority of AMP meters report through existing networks.

White also made a third point.

“We do not work hot; that is, we always have a power outage to install or change out the meter,” he said. “Most of our installs are adding a meter to a facility that

has none, not using the same socket of a conventional meter and plugging in an advanced meter. That is, we are typically installing the meter with new wiring and with no electricity crossing the wires during the install, thus eliminating the chances of a fire during the install process and greatly reducing the chance of fire resulting from old or corroded wiring.

“This process and other procedures identified in the installation plans, ensures that AMP-installed meters are safe at the time of install and throughout the life of

the meters.”

Army advanced electrical meters are a safe and cost-effective means of collecting and reporting meter data to ensure efficient energy stewardship by Army managers.

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At Fort Sill, microgrid demonstration

by Christopher Brown

In 2008, the Army spent more than \$4.1 billion on energy and fuel. This large demand has the Army developing energy strategies for installations, including better integration of alternative energy and renewable energy supplies. As installations combine these additional resources with existing utility and backup power systems, what is missing is a coordinated approach that optimizes energy surety, reliability and safety while also minimizing cost and environmental impact.

The solution for balancing this system of systems, in its most basic form, is referred to as microgrid technology, which the Construction Engineering Research Laboratory, part of the U.S. Army Engineer Research and Development Center, and Eaton Corporation are constructing at Fort Sill, Okla., for a demonstration starting in spring 2013.


The Fort Sill microgrid vision was developed around two basic principles. The first and utmost is the prevention of catastrophic loss of electrical, natural gas and water utility systems. The second encompasses mission utility security,

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has the added benefit of documenting everyone's work procedures to ensure continuity of operations when personnel turn over.

EMS is not a mysterious program to be avoided. Army EMS implementation has a long history and is not going away as a way of doing business. Take some time to think about how EMS processes can benefit your part of your installation. For more information on your installation's EMS, contact your environmental office.

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renewable mandates, and energy consumption and demand management principles.

At Fort Sill, a set of "starship" facilities that provides basic training housing to 22,000 military personnel are centrally cooled by chillers with a cold water loop. This central cooling method is very efficient, but a power outage can shut the system down.

Energy security is threatened by power outages. Typical backup power generators can maintain individual loads, such as a building, but as the plant size increases and the loads are distributed, the backup power system's design, sizing and controls become complex, and the resultant energy security is not adequate.

A backup power solution for natural or man-made emergencies often results in not having generation where it is needed. When the central power is lost, critical facilities need to be powered. Local power generation becomes essential, and the ability to distribute this locally generated power can be achieved through feeding power into the distribution system safely in the opposite direction. This method of powering critical loads is not possible with a conventional distribution system. It requires a microgrid with the necessary monitoring switchgear.

Renewable energy from photovoltaics and wind turbines is increasingly becoming a part of the energy mix, but renewable energy is shutdown when the utility has an outage. This situation cannot be accepted for the military installations of the future. A means of allowing renewable sources to operate in parallel with distributed generation is needed. During normal campus operation, distributed power and renewables can supplement utility power. In hot weather, the distributed generators



This emergency natural gas generator is part of the microgrid demonstration at Fort Sill. Photo by Misha Carlisle

can be programmed to dispatch power into the distribution system to reduce peak demand and stress on the central power system. Natural gas-powered generators are clean and are ideal for such utility support functions.

As demand for power has grown, the need for backup power and renewable integration has become important. To show that technologies are available to accomplish this integration, the Fort Sill project will demonstrate a coordinated approach that uses microgrids to deliver the energy security and surety needed.

The microgrid will allow critical loads to be powered either in parallel with the electric utility grid or islanded from the grid due to abnormal grid or fault conditions. A fast switching static switch with state-of-the-art local controls will allow seamless transition between each operating mode based on energy availability.

Critical and priority-based loads are included in the microgrid architecture and are reliably powered during islanding operation. Nonpriority loads can be shed autonomously through integrated controls. Distributed controller and user interface functions are integrated to optimize the microgrid's energy efficiency and reliability.

Benefits include:

- improved energy security, surety and reliability;



Pentagon generator powers energy security at Fort Bragg

by Melinda Harrington

When the Pentagon relocated its Naval Annex to expand Arlington National Cemetery, officials recognized that the site's generator was still viable and could be reallocated for use within the Department of Defense. Fort Bragg, N.C., had been planning and seeking funding for a microgrid and other energy security projects, and the installation was within a feasible distance for relocation. In January, the Pentagon contacted Fort Bragg to inquire if the installation could use the 93,000 pound and 2.7 megawatt diesel generator. The answer was a definitive yes.

Fort Bragg had experienced a disruption of power in April 2011 when a tornado crossed the installation and left a wake of destruction. In the aftermath, the installation identified opportunities for enhanced alternate power on various facilities in the event of catastrophe. Fort Bragg conducted an extensive energy security assessment to identify additional energy security opportunities. In addition to the assessment, shovel-ready energy security projects were developed.

One of the planned projects isolated a portion of an electrical distribution feeder from the rest of the post, forming a microgrid. Microgrids ensure that critical facilities receive power regardless of threats to the installation. Fort Bragg welcomed

the invitation to receive a "free" generator that could be used to create this microgrid and funded its relocation.

The generator will provide an alternate power source for critical facilities including the Directorate of Emergency Services, which houses the Fort Bragg 911 call center. The Directorate of Public Works Energy Program is now seeking air permitting and funding that would allow the generator to serve a dual purpose: energy security and peak shaving.

Because energy costs during peak use periods can extend exponentially beyond the normal price, Fort Bragg actively works to decrease demand through peak shaving by activating generators and engaging building energy monitors who encourage conscious conservation and reinforce end-user behavior.

In keeping with the Army Triple Bottom Line of Mission, Environment and Community, the Army defines energy security as, "an effective and innovative Army energy posture, which enhances and ensures mission success and quality of life for our Soldiers, Civilians and their



A Pentagon generator is offloaded after relocation to Fort Bragg as part of an energy security and peak-shaving project. Photo by Keith McAllister

Families through leadership, partnership and ownership and also serves as a model for the nation."

The partnership between the Pentagon and Fort Bragg demonstrates a sustainable solution that embodies that definition. As a result, the Department of Defense saved valuable fiscal resources and provided a solution for an installation that is identifying scalable energy security projects.

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- lower utility costs and decreased greenhouse gas emissions;
- short-term peak shaving for demand management; and
- demonstration of a path forward for critical emerging developmental technologies applicable to tactical military microgrids.

The microgrid demonstration will focus on hardware and solutions that are easily replicable to achieve a future Fort Sill total microgrid and that are extendable to other military post environments. To accomplish

this goal, the demonstration will prove the performance of advanced microgrid controls with traditional generators, the incorporation of high specific power and high energy storage, and the integration of renewable energy.

This demonstration will include several distributed sources in a microgrid — two natural gas generators, energy storage, a photovoltaic array and a wind turbine. The microgrid will be connected to the utility through a static switch for seamless transfer to an island.

The installed microgrid will

demonstrate the ability to optimally control power resources during normal operation; maximize economic benefit; reduce carbon emissions; and provide sustainable, reliable and secure power to critical mission loads during a power outage. The installation will also prove the microgrid technology advancement of connecting two microgrids.

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West Point combines funding sources to increase energy benefits through Energy Savings Performance Contracting

by Col. Nello Tortora, John Saams and Paul Simihtis

Executing planned Sustainment, Restoration and Modernization projects within an Energy Savings Performance Contract allows for an increase in the size and scope of energy efficiency, water conservation and renewable projects. This strategy accelerates progress toward sustainability goals.

The U. S. Army Garrison West Point, N.Y., doubled the impact of available SRM funding through strategic use of its ESPC program. In addition, the SRM-funded work provided a performance guarantee, which is not available with traditional SRM contracting mechanisms. These benefits were critical to West Point meeting its net-zero energy objectives.

Project highlights

Similar to many Army garrisons, West Point faces aging and constrained infrastructure, expanding mission and facilities due to Base Realignment and Closure, and aggressive energy reduction goals combined with limited staff and funding to accomplish projects. The garrison's unique mission requires

special project considerations and close coordination of all work activities. In addition, West Point was chosen as an Army net-zero energy pilot with the goal of effectively producing as much energy as it consumes by 2020 without receiving additional funding or staffing.

These challenges required that West Point maximize the impact of every available project dollar. Previous experience implementing more than 10 ESPC task orders in the late 1990s and early 2000s provided an obvious path for West Point to make progress against its energy goals and many of its infrastructure challenges.

West Point pursued a new ESPC task order with the support of the Army Corps of Engineers' Engineering and Support Center, Huntsville, Ala. The first task order under this contract was a \$26.6 million project consisting of six energy conservation measures that include lighting upgrades, installing a new energy management control system in 43 buildings, mechanical upgrades, kitchen hood improvements, steam system repairs and upgrades, and a photovoltaic

Acronyms and Abbreviations	
ESPC	Energy Savings Performance Contract
Huntsville Center	U.S. Army Engineering and Support Center, Huntsville
SRM	Sustainment, Restoration and Modernization

system that will showcase renewable energy. The initial investment will be paid from guaranteed savings over an 18-year contract term.

The task order also included \$1.2 million in SRM funds to replace aging equipment that could not be paid from savings. The Energy Independence and Security Act of 2007 allows the combination of these funding streams.

West Point identified an additional \$1.8 million in SRM funds after the task order award that could be applied to the ESPC project to further maximize the energy savings. Through close partnership among West Point, Huntsville Center and the ESPC contractor, NORESKO, the impact of additional SRM-funded work was evaluated and tracked, resulting in the ability to capture deeper energy savings opportunities that could be implemented as part of the project.

By combining the \$1.8 million in SRM funds with more than \$400,000 in additional annual energy savings generated by the SRM proposed improvements, the ESPC project's scope and size increased by an additional \$3.4 million. The additional scope included expanding the energy management control system to 10 more buildings, providing a roof replacement, increasing the photovoltaic system's size from 50 kW to 200 kW and installing a natural gas line for a boiler conversion. Applying this strategy, West Point accomplished much more within the same budget, expanding the project from \$26.6 million to almost \$30 million without altering the overall contract term.

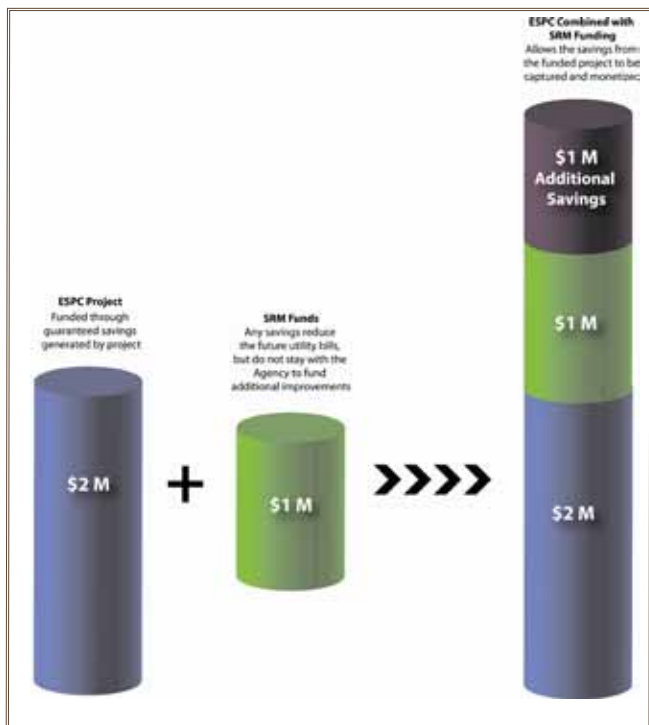
By maximizing its available resources, West Point will meet its 2015 energy



By combining ESPC with SRM funding, West Point maximizes facility infrastructure improvements and meets energy reduction goals. West Point photo



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Combining SRM and ESPC funding delivers added value to the Army. Graphic by John Saams

goal two years early. The synergy of using SRM funds within the ESPC is demonstrated by energy consumption savings. The SRM project, if executed outside of the ESPC, would generate 1,629 MBtu per year savings. The original ESPC project, without the additional SRM funds, would generate 179,461 MBtu per year savings. The combined project generates 194,798 MBtu per year savings, an increase of 13,708 MBtu a year over executing the projects separately.

Benefits

Benefit 1: Accomplish projects with inadequate SRM funding – When a planned SRM project is not sufficiently funded, the energy savings from such combined projects may be able to finance the remaining cost of that project and allow it to move forward under an ESPC.

Benefit 2: Expand project scope to accelerate progress toward energy goals – If savings are not needed to support

the SRM project, the amount financed through the ESPC can be increased and the project scope expanded. When the expanded scope also generates additional savings, the money saved allows for even further scope expansion without changes to the project's financial structure. At West Point, this approach effectively doubled the value of the SRM funding applied to the ESPC project. This leverage effect is affected by the ESPC project's economic factors and the specific work identified including simple payback of SRM funded and expanded scope work, interest rate, financing terms and other project variables.

Benefit 3: Streamline contracting and oversight responsibilities

– Combining related energy projects allows a site to standardize designs and equipment, which also simplifies the training of operations and maintenance staff and reduces inventory requirements. Unlike for standard SRM projects, these benefits are also supported by a long-term performance guarantee.

How it works

The strategy takes advantage of the savings generated by SRM-funded work. When executed outside of an ESPC, an SRM project generates utility savings that are immediately realized by the garrison but usually result in a corresponding reduction in utility account funding. Combining SRM work within an ESPC means those savings can be turned into additional project funds.



The garrison can use the additional funds to address the most pressing challenges and obstacles. This strategy

moves a garrison more quickly toward its energy-reduction goals and ultimately toward achieving net-zero energy status.

The amount leveraged is related to numerous factors, including the payback of the funded and expanded scope and the financing terms, but its use is flexible. The garrison may choose to use the savings to expand program or technical support that does not directly generate savings but may address other resource issues that are hampering energy program progress. The key is for the garrison to determine where best to use its savings and to maximize the benefit of those savings through the use of ESPC.

For a more detailed analysis of the financial and energy-efficiency benefits of combining SRM funds with an ESPC, see the report *Mixing Appropriations and Private Financing to Meet Federal Energy Management Goals* by John Shonder, Oak Ridge National Laboratory, at http://www.ornl.gov/sci/ees/etsd/btr/c/publications/ORNL%20TM%202012_235.pdf.

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Project highlights

- ▶ \$26.6 million in infrastructure improvements
- ▶ \$55 million in guaranteed savings over the contract term
- ▶ 14 percent reduction in energy consumption over 2003 baseline
- ▶ 26 percent reduction in building energy intensity
- ▶ 16 percent reduction in greenhouse gas emissions over 2008 baseline



Fort Greely energy improvements

by Carl Ramos

Located in the heart of Alaska where winter temperatures can reach 70 below zero, Fort Greely is making big strides toward improving its energy efficiency. Most of its facilities were constructed in the 1950s and 1960s when oil was cheap and buildings were not insulated. One would think that in an arctic environment, insulation would have been a priority. Not so. As a result, Fort Greely has one of the highest energy costs per square foot in the Army.

The high energy cost combined with the fuel-oil-powered Central Heat and Power Plant have made energy improvements a top priority for the last several years. With the recent increases in fuel costs, Fort Greely has every incentive to reduce usage and find alternative forms of energy.

To compound the aged facilities problem, the installation was “warm based” due to Base Realignment and Closure in 1995. *Warm basing* means providing minimal heat to facilities so they don’t freeze and cause permanent damage. As a result, very minimal maintenance was done on most of the facilities, and some were completely neglected.

In 2001, the Missile Defense Agency chose Fort Greely for its northern missile defense complex and began to use buildings that had not been in service. Still, very little funding was applied to the aged infrastructure since a majority of the funding was needed for new mission buildings.

In 2002, Fort Greely joined the ranks of Installation Management Command installations, and funding was finally available for improvements. Recognizing that Military Construction dollars were scarce and replacing buildings was not an option, the Directorate of Public Works decided to make the most of what they had. Fort Greely began using a three-phased approach to make

energy improvements.

Phase I – The first step is to repair the existing building envelopes focusing on increasing R-value and reducing infiltration. These goals are achieved by adding insulation through application of an external insulation finish system to the building walls and replacing the aging, leaky doors and windows with energy-efficient ones. As roofs are replaced, the insulation is increased to provide an R-value of 60.

Phase II – Once envelope improvements are completed, the mechanical system receives a complete overhaul. Steam heat systems are changed to hydronic glycol systems. Demand control ventilation, high efficiency motors and variable frequency drives replace continuous run ventilation systems. Pneumatic controls that no longer function are replaced with state-of-the-art direct digital controls.

The existing control systems were in such poor condition that in many buildings the temperatures could not be controlled. Office temperatures were actually adjusted by opening windows even when the temperature outside was 50 below zero. The new controls are changing that situation and allowing the capability to provide nighttime setbacks to further drive efficiency.

The direct digital controls are connected through a wireless control network that can be accessed from anywhere on post. Maintenance technicians can monitor heating, ventilating and air conditioning systems from their shops and identify problems in real time. Plans call for “toughbooks,” which are laptops that the technicians can carry to the field to perform diagnostic checks.

The system is working, and Fort Greely is beginning to see savings from the repairs made so far. But it is not enough. The



Workers install an external insulation finish system to improve the building’s energy efficiency at Fort Greely. Photo courtesy of DPW, Fort Greely

plan to repair one building at a time will take years at current funding levels, so the DPW initiated an Energy Savings Performance Contract to make the needed improvements more quickly.

The first task order on the contract will install the control system on all major buildings and provide programmable thermostats for the smaller buildings that do not justify a complete control system. Also included on the first task order are upgrades to on-post lighting and some mechanical system upgrades.

Phase III – The third step is to construct a biomass cogeneration facility and begin heating and providing electric power to the entire installation using an alternative renewable fuel source. Using biomass fuel instead of fuel oil could cut the installation fuel costs in half.

After performing a feasibility study in 2010, the DPW requested proposals and expects to receive them in December. A cost-benefit analysis of the proposals will determine which one is best. The plan is to have an operating system by the fall of 2014.

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Carl Ramos, PE, is the chief of Engineering, DPW, Fort Greely.

Acronyms and Abbreviations

DPW	Directorate of Public Works
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Presidio of Monterey retrofits gym as net-zero electrical facility

by Brian Clark

Solar power came to the Presidio of Monterey, Calif., with the April completion of a 370 kW photovoltaic array on the Price Fitness Center's roof. The PV array was sized to provide for the fitness center's annual electrical needs and is projected to give the Presidio its first net-zero electrical facility.

The building may need to pull from the electrical grid during cloudy or winter months for its many lighting, fan and plug load requirements, but over the course of the year, so much power will be returned to the utility company on clearer days that the array's production will effectively cancel out the building's yearly consumption of more than 600 MWh.

Answering the Army's call for cleaner, more independent energy sources, the Presidio has simultaneously lowered its yearly carbon emissions, annual net electrical use and recurring utility budget with the inauguration of its first major solar project.

Price Fitness Center was selected as the Presidio's first solar site based on its large and available flat roof area, its solar access and because it is one of the few buildings on post with an individual electrical meter.



The Presidio of Monterey's Price Fitness Center rooftop solar array generates the power to make the center a net-zero electrical facility. Photo by Jay Tulley

Yet, as one of the largest electrical users tracked on the Presidio, the fitness center also offered one of the largest potentials for savings.

Adhering to the hierarchy of the net-zero vision, the installation established several energy-efficiency projects prior to pursuing renewable energy sources. This multi-pronged approach included retrofitting gymnasium lighting from high pressure sodium to T5 fluorescent; converting exterior lights from high pressure sodium to LED; upgrading pneumatic heating, ventilating and air conditioning controls to the industry standard direct digital controls; and recommissioning the HVAC system to decrease the fan load. With these energy-conservation measures in place to drive down the building's electrical consumption, solar power is now online to provide for the difference.

After the building was identified, many challenges had to be addressed to move the project forward. The gravel roof was past its useful life, so a membrane roof was installed through a separately funded project. By changing from gravel to membrane, the roof's weight was reduced enough to use ballasts instead of anchors, which could have been a source of leaks.

The most difficult hurdle turned out to be getting the interconnection agreement between the local electric utility and the Army. Legal verbiage involving indemnification and insurance

Acronyms and Abbreviations	
DPW	Directorate of Public Works
HVAC	heating, ventilating and air conditioning
PV	photovoltaic

requirements caused months of delays before the system could be officially turned on.

At the heavily used and highly visible facility, gym-goers can discover the impact of the otherwise unseen project through an interactive kiosk. Along the lobby wall, a touch-screen monitor displays real-time array performance data in a variety of formats. Scores of service members and Civilians who use the facility for exercise, assembly and training can now see firsthand the installation conservation efforts by viewing daily power outputs, carbon footprint reductions and total energy saved to date.

This live solar array feed has remote viewing capabilities that present opportunities to garrison engineering and maintenance staffs as well. The Directorate of Public Works will use the array's trends and traits to help drive future PV projects. Operations and maintenance personnel will be alerted to unexpected drops in power as panels become dirty or damaged so they can respond.

Yet, renewable energy is only one effort in the greater greening of the Army. True conservation requires total participation.

Thanks to the help of U.S. Army Corps of Engineers and the solar contractor DRI Energy, Presidio DPW expects this first success in the solar arena to be a precursor to the larger installation-level effort of conservation being waged under the roofs.

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Dugway Army Family housing units achieve LEED Platinum

by John R. Craig

Twenty new Army Family housing units at Dugway Proving Ground, Utah, an American Recovery and Revitalization Act project that was delayed for more than two years by a series of bid protests, was completed in July. The final product was well worth the wait. In the end, the construction earned a nationally accepted green rating system's highest level.

The original design-build request for proposals, published by the U.S. Army Corps of Engineers' Center of Standardization for Army Family Housing at Norfolk District, required that the design and construction meet Leadership in Energy and Environmental Design Silver requirements, as is policy. The successful prime contractor, Diversified Maintenance Systems of Salt Lake City, offered to meet the LEED Gold standard, a betterment within its proposal.

With significant bid savings from the programmed amount, ground source heat pumps were added as a user-requested change. That addition, along with a thoughtful design and careful attention to detail during construction, resulted in a LEED Platinum rating.

With 342 units, Dugway maintains the largest inventory of Army-owned Family housing remaining within the continental United States. The majority of those units were built in the 1950s as Wherry-style construction, which is slab on grade with unreinforced cinder block, single pane aluminum windows, fuel oil-fired heat and domestic hot water, evaporative coolers and very little insulation. The estimated utility bill for each new home is only \$50 per month, compared with about \$200 per month for the similar sized units they replaced.

The LEED residential standards are significantly different from the LEED standards used for mission, mission support or administrative facilities. As opposed to gaining qualification points for each energy-saving technology or technique used, a Home Energy Rating System is first applied. A lower HERS rating means a smaller number of qualification points are required for each LEED rating.

Each structure is individually rated using both the HERS rating and the LEED Checklist for Homes. The remote and isolated nature of Dugway, located at the southern edge of the Great Salt Lake Desert, resulted in the inability to obtain points for access to public transportation or very close proximity to the fixed locations of its limited community support facilities. However, LEED points were captured in each of the

Acronyms and Abbreviations	
HERS	Home Energy Rating System
LEED	Leadership in Energy and Environmental Design

checklist's sections.

Section I, Innovation and Design Process – Using a fully integrated project team, the design charrette process for final development and a credentialed outside expert to manage overall quality, the project captured nine out of 11 points.

Section II, Location and Linkages – By capitalizing on a previously developed housing site with some existing infrastructure and access to open space, eight of 10 possible points were captured even with the lack of public transit and extensive community resources.

Section III, Sustainable Sites – The contractor effectively controlled erosion during construction, used low-water demand and drought-tolerant plants in the landscaping, incorporated surface-water collection to manage the surface runoff and route the rainwater for beneficial use, and employed nontoxic pest control measures to capture 19 of 22 points. In fact, the government's decisions to require low density construction and place sod to provide an oasis feel within this high desert environment resulted in the loss of points in this section.

Section IV, Water Efficiency – Nine of a possible 15 points were captured through the installation of very high-efficiency fixtures and fittings as well as an integrated, high-efficiency lawn irrigation system.

Section V, Energy and Atmosphere – The HERS rating came into play here, and a separate index was calculated for each of the



Assistant Secretary of the Army for Installations, Energy and Environment Katherine Hammack assisted by Dugway installation commander, Col. Scott Estes, cuts the ribbon for Dugway's LEED Platinum housing. Photos by Bonnie A. Robinson



This single-family four-bedroom unit is part of the project that earned LEED Platinum at Dugway Proving Ground.



At Fort Jackson, harnessing the energy of the sun

by Ashley Rogers

The Quad Dining Facility at Fort Jackson, S.C., a \$24.6 million project begun in June 2010, was completed July 19. The Quad DFAC is surrounded by four “starships” that house 1,300 Soldiers each and include barracks, classrooms and offices. With its massive capacity and efficiency, the Quad DFAC can feed all 5,200 Soldiers from the four starships three meals per day in only 90 minutes per meal.

While this capability is impressive, the building’s most distinctive feature is its ability to produce hot water for the Soldiers by harnessing the sun’s energy.

To save energy associated with domestic hot water use, the Quad DFAC contractor constructed a solar water heating system known as the Sun Equinox, which uses a vacuum tube array-type solar panel that provides a 30 percent savings in energy costs.

“This system was chosen for its ease of maintenance, simplicity of design, efficiency and positive life-cycle cost characteristics,” said Max Carroll, the Quad DFAC project manager.

This technology is new to Fort Jackson

Acronyms and Abbreviations	
DFAC	dining facility
EITF	Energy Initiatives Task Force
LEED	Leadership in Energy and Environmental Design
USACE	U.S. Army Corps of Engineers

but is becoming more common throughout the nation with the push for Leadership in Energy and Environmental Design certification in newly constructed government buildings. The LEED program provides a guide for design and construction of green buildings. Using green technologies, companies can reduce negative environmental impacts while saving money on energy costs. LEED certification is a tiered rating system that evaluates buildings on sustainability.

“All new military buildings must have a LEED Silver rating,” stated Carroll “This solar water heating system contributes to the Quad DFAC’s certification. While initial installation costs are higher, these technologies are expected to save money over time and reduce dependence on fossil fuels.”

The American military is leading the race to renewable energy sources. The U.S. Army’s goal is to reach 25 percent clean power by 2025. The Army Corps of Engineers is part of the Energy Initiatives Task Force created by the U.S. Army to attain this goal.

“The military has recognized its



Tom Hordnes (top) and Patricia Smith, USACE construction inspectors, check the vacuum tube arrays of the solar panels that will save energy for Fort Jackson’s new Quad DFAC. Photo by Sean McBride, public affairs specialist, Charleston District

overreliance on fossil fuels,” said Jon Powers, director of outreach for EITF. “The significant strides toward renewable power are seen as operation-necessary, financially prudent and mission-critical.”

The Corps’ Charleston District looks forward to continuing to find ways to eliminate the carbon footprint left by construction.

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five housing styles. Features such as the exclusive use of CFLs; ground source heat pumps; Energy Star 3.0 appliances; additional insulation; double-pane, low emissivity windows; no air infiltration; and daylight tubes in the baths and walk-in closets resulted in bringing the HERS indexes down to values between 58 and 70, which equated to 13-20 LEED points. The HERS indexes resulted in the LEED Platinum required point totals being a

minimum of 85 and a maximum of 94.

Section VI, Materials and Resources – Through framing efficiencies, maximized recycled and environmentally friendly materials, and minimized waste generation, 12 of 16 points were credited.

Section VII, Indoor Environmental Quality – Aggressive ventilation and extensive sealing, radon protective construction methods and an automatic carbon monoxide venting system in the garages resulted in 18 of 21 points.

Section VIII, Awareness and Education – A full three of three points were captured through an extensive public awareness campaign and enhanced training for both the occupants and the maintenance staff.

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Lewis-McChord composting success: Can your post do the same?

by James Lee and Ron Norton

Composting organic waste on military bases has proven to be a successful, cost-effective method for reducing the volume of solid waste that would otherwise be landfilled. Joint Base Lewis-McChord, Wash., achieved relatively high solid waste diversion rates by using this option. Composting organic waste streams — including preconsumer food waste, landscape clippings, stable manure, storm debris and wastewater treatment plant biosolids — contributes 4,000 to 5,000 tons of solid waste diversion each year.

If composting organic waste at one installation has been successful, is it likely to be successful at another installation? And if one particular compost technology at one location has been successful, would it necessarily be successful at any other location? This article shares the JB Lewis-McChord composting experience and offers a guide to installations or similarly sized municipalities for determining the feasibility of starting a composting program.

Challenges and successes

Compostable organic waste was formally identified as a significant portion of the solid waste stream at JB Lewis-McChord by a 2004 solid waste characterization survey. The survey determined that almost 50 percent of the waste consisted of compostable organic material.

The garrison proposed and was resourced for a compost pilot program from 2004 through 2005. The garrison selected an aerated static pile technology that requires relatively low maintenance and produces consistent results.

The volume of organic waste diverted at the facility has progressively increased with additional organic sources — food waste — since the program's beginning. Today, the program is responsible for almost one-third of the base's overall solid waste diversion tonnage. The compost product generated is of "exceptional quality," as

defined by WAC 173-308-80 and is sold in bulk to the general public by Internet auction.

The two factors that contributed to JB Lewis-McChord's composting program success were:

- The installation waste hauler's provision of compostable liners in the food waste collection containers and direct transportation to the compost facility site.
- The willingness of the waste generators — dining facilities and others — to modify their waste management processes to segregate the organics from noncompostable refuse.

Prerequisites

Despite the JB Lewis-McChord success story, composting is not easy. If not situated, designed, permitted and operated properly, a composting operation can create large foul odor problems, opening up the installation to regulatory and community scrutiny. The JB Lewis-McChord team considers waste stream knowledge the first prerequisite.

Installations should ask a series of yes-or-no questions before committing serious resources to a composting operation. If the answer to each question is "yes," composting may be a potential option for an integrated solid waste management program.

1. Is the percentage of compostable organics in your installation waste stream known? If this percentage is unknown, the best place for a waste manager to start is with a comprehensive waste characterization survey that includes "compostable organics" as one of the categories.

2. Are off-site tipping fees for compostable organics generated on your installation competitive with your current waste disposal costs? A market analysis of local organic waste management facilities can provide a solid waste manager with one of the most important facts that have to be determined before decisions can be

Acronyms and Abbreviations	
DLA-DS	Defense Logistic Agency Disposition Service
EMS	Environmental Management System
JB	Joint Base

made. Typically, organic waste processing operations tend to narrowly focus on a particular material type due to the negative consequences of contamination that could impact product quality.

3. Is a site available on or near your installation that can support a full scale compost operation? Composting, if properly controlled, is an aerobic process that generates very little nuisance odor. However, temporary storage of certain feed stock and product that is not properly managed can, under certain conditions, create massive off-site odor issues that will lead to notices of violation, fines, lawsuits and health department-directed facility shutdown orders.

4. Do you have positive working relationships with your installation's local permitting authority and waste regulators, waste collection haulers, critical in-house stakeholders, waste-stream generators and command decision makers? Team JB Lewis-McChord's experience has shown that almost anyone involved can stop any action, but it generally takes ➤



JB Lewis-McChord's compost product is sold in 100 cubic yard lots on the Internet. Photos by Doug Skitch



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the combined, unified efforts of all the individuals involved from all agencies to accomplish a working final outcome. This generalization applies very well to starting a new compost activity or even diverting compostable organics off site. An experienced solid waste manager can probably predict the potential challenges in advance.

Management outreach and training is a critical requirement to ensure the quality of inbound material, which impacts outbound product quality. Team JB Lewis-McChord has taken advantage of a useful aspect of its Environmental Management System by documenting and updating written procedures for each aspect of the compost process, including collection and facility operation. This step has helped reduce confusion by using the EMS “plan, do, check” process.

5. Does your installation have several feasible options for managing compostable organics including other technologies like

anaerobic digestion, in-house operated composting or contracted composting off site? These options may include a local municipality operation with extra capacity. Success is unlikely where only one feasible option exists. Situations in which multiple options exist tend to be serious candidates for success.

For example, after the pilot project, JB Lewis-McChord could have opted to haul its green waste to nearby communities. However, the installation needed to address problematic biosolids waste generated at the wastewater treatment plant. No feasible options for off-site management existed, which weighed heavily upon the decision to stand up an in-house compost program. Using an in-house operation with an existing facility, new equipment and training in-house staff made better economic sense than off-site alternatives at the time. In hindsight, the in-house option still makes sense, but if that were not an option, the other choices would have been cost competitive with landfill disposal.

6. Can a pilot compost project be

conducted with your installation’s compostable organic waste? “Investment” funding, like any other sector of public funding is currently under a lot of stress. But, if a return on investment is likely and could be convincingly demonstrated, pilot project investment funds do exist, spurred by potential long-term cost savings and long-term liability reduction.


7. Does a significant on-site need or market for compost product exist within the general vicinity of your installation?

The first compost generated at JB Lewis-McChord was used on post for several projects, including a storm-water treatment facility, sidewalk replacement and landscaping median improvements. Some of the compost product is still used in-house and for Military Construction, but the volume now typically surpasses what can be used on base.

Through Government Liquidators, a Defense Logistics Agency Disposition Services’s partner, the installation sells excess compost in bulk to the general public via live Internet auction at www.govliquidators.com. Government Liquidators advertises the compost in 100 cubic yard lots on its website. Buyers log on and bid for the property, just like on eBay. From July 2011 to July 2012, JB Lewis-McChord sold 2,000 cubic yards of product by bulk Internet sales.

In 2013, the installation plans to tap the local retail market by obtaining the U.S. Compost Council’s Seal of Testing Assurance certification and marketing the product in one cubic foot capacity bags, generating much higher profits for the Qualified Recycling Program.

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JB Lewis-McChord processes and stores its composted material at an on-site compost yard.



Fort Hood: 10 tips to reach net-zero waste

by Jennifer Rawlings

In April 2011, the Army selected Fort Hood, Texas, as a net-zero waste pilot installation. The NZW goals are to reduce waste generated, repurpose serviceable materials, maximize waste-stream recycling to reclaim recyclable and compostable materials, and recover the remaining waste for energy production with minimal to no landfill by the year 2020.

The following quick tips are a culmination of lessons learned and process changes that are helping guide Fort Hood towards NZW.

1. Develop a logo, slogan, mascot and promotion materials as a marketing campaign to gain excitement around the initiative. Continual education and training of installation personnel are key to developing a culture change.

2. Select a NZW project officer to oversee the program and assign appropriate and influential garrison directors to be NZW goal leaders for each work group area: reduce, reuse, recycle and compost, and marketing and outreach.

3. Plan and organize a NZW conference with at least 100 key military and garrison personnel to introduce the NZW concepts. Then, break them into groups to brainstorm process improvement ideas for the goal areas.

4. Have the commanding general and garrison commander assign conference attendees to be permanent members on the NZW work groups that will implement project ideas. Add subject matter experts to the work groups to help develop project action plans and assign proponents.

5. Have NZW work groups narrow down project priorities and develop an installation policy that includes the work group's priority projects. Conduct a waste characterization to ensure the priority

projects tackle the large waste streams entering the landfill.

6. Incorporate NZW into the Environmental Management System process and have work group goal leaders report their priority project status to the commanding general and garrison commander at the quarterly Environmental Quality Control Committee meetings.

7. Integrate NZW into the installation strategic plan to increase leadership attention and support.

8. Develop metrics and measure progress by ensuring data is collected correctly and incorporates reuse, diversion, recycling and composting efforts. For example, work with Defense Logistics Agency Disposition Services, contractors, landfill and recycling personnel, and composting entities to ensure diversion numbers are accurate and reported on time.

9. Use existing installation funding sources along with other Army funding sources and alternate financing mechanisms to support planning, environmental analysis and project development.

10. Collaborate with other installations to gain lessons learned and best practices to seek opportunities for improvement.

To support the NZW effort, Fort Hood is creating a culture that recognizes the value of sustainability measured not just in terms of financial payback but also in the benefits of maintaining mission capability, quality of life, relationships with local communities and the preservation of opportunities for the Army's future.

Fort Hood narrowed down its top priority projects based on the results of a waste characterization study. The Reduce Work Group developed a printing reduction operations order, included an NZW clause in all OPORDs and disseminated information on ways to reduce junk mail. The work group will next focus on paperless processing, food waste reduction, supply discipline, green procurement and incentive based contracts.



Containers with restricted openings and pictured signage help customers with sorting their recyclables. Photo courtesy of Jennifer Rawlings

The Repurpose Work Group conducted a postwide yard sale that diverted four tons of material from the landfill by donating unsold items to local charities. This event was so successful, the work group decided to hold one biannually and include barracks along with housing areas. This work group also identified future priority projects: Defense Logistics Agency Disposition Services enhancement, food donations, construction and demolition material recovery and reuse, a building to store serviceable items such as furniture for repair and reuse, and a website similar to Craig's List to facilitate material reuse on post.

The Recycle Work Group established *Hood Hero Awards* for top recycling performers and visited all organizations to ensure recycling is conducted properly. This work group continues to work high priority projects such as increasing the number of recycle containers, implementing recycling incentives, converting housing areas to 96-gallon single-stream collection, investigating food waste composting, converting consumer-contaminated waste into compostable items and identifying recycle center process improvements.

Marketing and outreach are essential ►

Acronyms and Abbreviations	
NZW	net-zero waste
OPORD	operations order



At Fort Stewart, wood chips help fuel installation

by Jeff Mangun

The Fort Stewart and Hunter Army Airfield, Ga., Directorate of Public Works looked to the installation's most abundant resource, timber, for ways to save both money and energy. With more than 150,000 acres of forested training lands to manage, the FS/HAAF Forestry Program is one of the largest in the Department of Defense.

FS/HAAF harvests 5,000 to 6,000 acres of timber annually. Finding a viable use for the large quantities of unmerchantable debris left after these timber harvests became a priority.

Working with the post's central energy plant, the DPW Environmental Division's Forestry Branch developed an initiative that provides unsellable logging debris to the CEP. The woody biomass is chipped on site and hauled to the CEP for steam generation.

After each timber harvest, large piles of unmerchantable timber debris, mostly in the form of tree limbs and tops, are left behind. Trees contaminated with full-metal jacketed bullets and shrapnel that can't be sold commercially are also left behind. The metal is removed via magnets before the wood is burned in the CEP's wood-fired boiler.

After the loggers move out, the Forestry Branch hauls their equipment to the site and chips the debris that has been left behind with a large wood chipper. The wood chips are blown into semitrailers for transport. When the trailers are full, they are taken to the CEP where the chips become a renewable, sustainable energy resource.

At the CEP, the wood chips are weighed and checked for moisture content. The



Jeff Mangun displays full metal jacketed bullets removed from trees during the chip and haul process. Photo courtesy of Public Affairs Office, FS/HAAF

chips are then put on a conveyor belt that takes them to the stockyard where they are stored. As needed, the wood chips are taken from the yard and put into a hopper that sends them to the wood-fired boiler. Energy resulting from burning the wood chips produces steam for the CEP as well as chilled water and hot water for about 25 to 30 percent of the installation's needs. The Chip and Haul program saves FS/HAAF about \$1 million a year by not having to purchase chips for fuel on the open market.

The Chip and Haul program has been fully operational since October 2011. Forestry Branch provides the labor and necessary equipment to chip and haul the biomass to the CEP. To date, the operation has provided almost 900 loads, equating to roughly 17,000 tons of woody biomass.

Aside from the financial benefits of the program, this initiative allows forestry labor

to recover an otherwise wasted natural resource while providing some energy independence and cost efficiency, and while supplying high quality chips to the CEP resulting in better emissions, less damage to CEP equipment, fewer scrubber problems and cleaner sediment ponds. The program also provides a cleaner environment for military units in which to train by removing the debris from the forest floor that otherwise may have become fuel for wildfires.

This initiative is a great example of the outstanding reuse and recycle program on post and is in keeping with the installation's Sustainability Management System policy: ROCK, which stands for "resources, optimize, compliance, keep improving."

Energy security plays a large role in our national security, and that is why FS/HAAF is committed to achieving energy independence. The Chip and Haul program is a step in the right direction toward energy independence and installation sustainability. FS/HAAF continues to work toward energy independence and remains focused on developing strategies, like the Chip and Haul program, that support the installation's and the nation's energy independence.

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Acronyms and Abbreviations	
CEP	central energy plant
DPW	Directorate of Public Works
FS/HAAF	Fort Stewart and Hunter Army Airfield

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to the success of any NZW program, and this work group prepares and disseminates brochures, training materials, articles, a website, social media and a NZW super hero mascot.

The Fort Hood NZW vision ensures that sustainable practices will be instilled and managed throughout the installation while maximizing operational capability, resource availability and the well-being of all Central Texas residents.



Fort Bragg places priority on water conservation, quality

by Jonelle Kimbrough

Just as water is essential for life, water is also essential for Fort Bragg, N.C. The post consumes an average of 1.6 billion gallons of water at a cost of \$2.4 million annually. However, water is a precious and finite resource.

“In an area prone to drought and an ever increasing demand for water, it is crucial for water conservation to be integrated into our daily lives,” said Lynda Pfau of Sustainable Fort Bragg.

Although the Fayetteville, N.C., Public Works Commission and the Harnett County Department of Public Utilities supply municipal water, the Fort Bragg Directorate of Public Works strives to ensure its efficient use and quality through water conservation, low-impact development, water-efficient facilities and controlled watering points.

Water conservation

Fort Bragg maintains an installationwide, year-round water conservation policy. The policy outlines the distinct phases of water conservation, from the least restrictive practices during nondrought conditions to the most stringent practices when potable water use is significantly restricted.

The policy also identifies water-related activities across commands, directorates and tenants as well as the steps to which activities must conform to meet the conservation levels. Soldiers, Civilians and Families are all responsible for decreased consumption. The goal is a 2 percent reduction in potable water use every year or a 26 percent reduction by 2020, based on 2007 standards.

An assertive public education drive supports the policy. Sustainable Fort Bragg distributes water conservation information to the community through installation newspaper articles, social media posts and notices in facilities.

July is the official installation Water Conservation Month. This year, Sustainable Fort Bragg hosted the

inaugural “Water You Doing to Conserve?” contests. Community members shared their innovative water-conservation methods on Facebook, and School Age Services participated in a poster competition for children.

Low-impact development

Low-impact development is Fort Bragg’s preferred method of storm-water management.

“LID balances growth needs with environmental protection,” explained Camille Cole of DPW’s Master Planning. LID is a viable means to achieve sustainability goals as well as Army standards for facilities and infrastructure.

Designed to mimic natural site water management prior to development, LID includes storm-water detention basins with native vegetation, rain barrels, rain gardens, infiltration channels, cisterns and permeable pavers. These practices retain storm water on site and allow for infiltration to replenish aquifers. In addition, LID methods reduce flooding and the need for expensive infrastructure improvements or maintenance costs such as curbs, gutters and storm sewers. LID also protects drinking water supplies, natural habitats and wildlife.

Water-efficient facilities

The design and construction of Fort Bragg facilities incorporates water-efficient technologies. Low-flow showerheads, faucet aerators and dual flush toilets are designed to produce a comfortable, effective flow rate. Yet, they require less water.

In structures with storm-water harvesting technology, rain is collected in cisterns and diverted for landscape irrigation and toilet flushing. Recycling storm water can dramatically reduce potable water consumption and can reduce the energy use and carbon dioxide emissions associated with

Acronyms and Abbreviations

DPW	Directorate of Public Works
LID	low-impact development

treating water.

“Water-efficient features provide a positive impact on the performance of a building,” Pfau commented. “By consuming less water, we can lower the operating costs of a building and conserve energy.”

To translate water conservation into practical terms, consider a typical Fort Bragg barracks structure that houses 300 Soldiers. Since two Soldiers share each shower facility, one such barracks averages 150 showerheads. Traditional showerheads consume 6.5 gallons of water every minute, but water-efficient showerheads consume only 2.5 gallons of water every minute. If every resident showered for five minutes each day with a traditional showerhead, the barracks would consume at least 4,875 gallons of water daily. However, if every resident showered for five minutes each



A Fort Bragg parking lot features LID water management techniques — permeable pavers, infiltration channels and rain gardens — designed to mimic the site’s predevelopment hydrology by allowing infiltration to the aquifer. Photo by Jonelle Kimbrough



Fort Shafter outdoor classroom gardens reuse rainwater

by Ann Wharton

Following the success of a “Saving Your Nation’s Energy,” or SYNERGY, outdoor classroom established nearly a year ago at Hale Kula Elementary School on Schofield Barracks, Hawaii, a second classroom has been built at Fort Shafter Elementary School.

Fifth-graders at both schools are using their gardens in sustainability projects, and school principals and teachers have developed activities that enhance the schools’ current programs. Administrators and educators are also taking advantage of new approaches to teach students about sustainability using the facilities.

Key to each outdoor classroom is a rain harvesting system. The 8-foot-wide by 9-foot-high tank can hold 3,000 gallons of rainwater collected from Fort Shafter Elementary School’s roofs. The rainwater harvesting system was the idea of Haley Diamond, a Clean Water Act Program specialist, Directorate of Public Works’ Environmental Division.

“The rainwater harvesting system

provides a wonderful opportunity to teach kids about conserving one of our most important natural resources, and they’ll also learn about the many benefits of reusing rainwater,” said Diamond.

Among its advantages, rainwater is free, makes efficient use of a valuable resource, conserves water and energy, benefits irrigation and produces thriving plants. Also of significance, stored rainwater is free of pollutants, salts and other natural and man-made contaminants.

Flowering native Hawaiian plants, such as *pohuehue*, or beach morning glory, and *pualoalo*, or hibiscus, are providing bursts of color in Fort Shafter Elementary’s above-ground gardens. Though native plants naturally conserve water, because they’re adapted to the local environment, mulch surrounds the plants to further help conserve water by preventing moisture in the soil from evaporating.



Modified downspouts deliver rainwater to 3,000-gallon rainwater harvesting tank (back center) in the Fort Shafter Elementary School’s outdoor classroom garden. Photo by Mark I. Brown, Lend Lease

Raised planters provide seating and an area for the native plants and others to grow. Shaded fabric extends to the classrooms to help keep students cool. The garden receives excess rainwater from a storage tank. The water is filtered through a local sandy-soil blend and gravel layer and delivered to the plants.

Lend Lease, managing partner of IPC, established the SYNERGY program to help create awareness about environmental, social and economic sustainability through information, resources and activities. Funding for the classrooms

Acronyms and Abbreviations

DPW	Directorate of Public Works
IPC	Island Palm Communities
USAG	U.S. Army Garrison

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day with a water-efficient showerhead, the barracks would consume only 1,875 gallons of water — a savings of 3,000 gallons per barracks or about 10 gallons per day for each Soldier housed in that facility.

Water-efficient features also achieve the conservation requirements of Leadership in Energy and Environmental Design, the standard the Army uses for facilities.

“Before any water-efficiency credit can be earned, the facility must meet the required 20 percent reduction in water use,” Pfau said. Additional may be earned through further water consumption reduction and water-efficient landscaping

with native plants that require less maintenance and irrigation.

Watering points


To ensure responsible water resources use in field applications, Fort Bragg established separate water points for potable water and nonpotable water. The potable water point is controlled by an electronic key card system, which prevents unauthorized use and protects the installation’s water distribution system. A nonpotable water point provides water for activities such as dust suppression and sod establishment.

“By having a site where nonpotable water can be obtained for appropriate purposes, we are protecting the quality of

our water for human consumption and conserving the amount of potable water used on the installation,” said Shannon Weston, Water Quality Program.

With these water management methods, Fort Bragg conserves fiscal resources, maintains its mission as a power projection platform and sustains the environment for the next generation — the right way ... the green way ... all the way!

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Integrated energy, water and waste planning tool demos in progress

by Michael Case

New simulation and optimization processes and tools can simultaneously consider hundreds of energy, water and waste measures, including interactions among them, to help installations develop integrated plans. Developed by researchers at the U.S. Army Engineer Research and Development Center, these tools are being demonstrated at the U.S. Military Academy, West Point, N.Y.; Fort Leonard Wood, Mo.; and Portsmouth Naval Shipyard, Maine.

These processes and tools are incorporated into a web-based integrated planning tool. Currently, the IPT focuses on energy, and plans to add water and solid waste during the coming year.

When projects are considered one at a time, on the basis of improving efficiency and life-cycle cost, progress toward installation or Armywide goals, such as achieving a net-zero installation, is likely to be incremental rather than transformative. ERDC has conducted extensive research into processes and tools used around the world to do integrated planning and examined a variety of analytical tools that bring valuable data to assist decision making.

Based on this research, ERDC developed the IPT to automate many of the repetitive tasks that engineers typically conduct when developing an integrated plan. In addition, the tool ensures that a wide variety of measures are evaluated in more depth than usual, ensuring that potentially effective measures are not missed simply because subject matter experts do not have experience with them.



Michael Case
Photo courtesy of ERDC

Sustainability measures

Photovoltaic panels, wind turbines, cogeneration through engines or turbines that produce both electric power and useful heat, LED lighting, cool roofs, advanced insulation, lighting controls, low-flow water fixtures, leak repair, reclaimed waste water or “purple pipe,” recycling programs and waste-to-energy plants are only some of the measures that installation planners might consider.

The term *measure* generically refers to any technology or practice that might be considered for application at an installation. It is common to calculate the performance and return-on-investment for any one of these measures. It is much more difficult to predict the performance and economics of many of these measures when applied at the same time and over a period of years.

Integrated planning

The IPT incorporates best practices for creating integrated plans involving energy, water and waste. Key points include:

- **Scope and time frame** – Identify the ele-

Acronyms and Abbreviations

CERL	Construction Engineering Research Laboratory
EM	efficiency measure
ERDC	Engineer Research and Development Center
IPT	Integrated Planning Tool

ments and areas that are in-scope and out-of-scope for the study, as well as the planning horizon in years.

- **Framing goals** – Establish key goals before creating the base case or coming up with alternatives, e.g., decrease energy usage by 40 percent.
- **Base case** – Establish the baseline energy, water and waste usage, current and projected, over the study period — critical to the analysis.
- **Efficiency measures** – Consider measures such as insulation, lighting and low-flow fixtures before adding expensive photovoltaics or other supply measures.
- **Distribution and supply** – IPT does the calculations and optimization needed to determine whether some form of centralized cogeneration or decentralization best meets framing goals at lowest cost, including conventional and renewable measures
- **Renewable energy** – Consider technologies such as photovoltaics, solar thermal, wind energy, biomass, biogas or synthetic gas as part of the mix during distribution and supply optimization.
- **Integrated plan** – IPT produces the plan by comparing the base case and alternatives using the metrics defined as part of the framing goals. Sensitivity analysis is conducted using the alternatives and ➤

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was received through a grant from the Lend Lease (U.S.) Community Fund, a nonprofit organization that supports service members who live in Lend Lease homes and the communities where its employees work and live.

“There was a lot of interest expressed

by local educators following the opening of the outdoor classroom at Hale Kula Elementary School, so we were excited to be able to work with our partners to bring a facility to another school that serves many of our military Families,” said Mark Frey, project director, IPC.

Additional support was provided by the DPW Environmental Division, USAG

Hawaii, IPC and local businesses that together donated more than \$12,000 in materials and 100 hours of labor.

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risk factors such as price volatility, availability and maintenance. The integrated plan contains a phased implementation strategy over the study period, showing public or private investment costs; predicted energy, water and waste reductions; and return on investment.

Establishing baseline

One IPT design goal was to simplify collection and analysis of base case data. A study team using the tool starts with geographic information system data in standard format and does initial characterization of facilities and systems before loading the data into a study.

Other information — such as the steam distribution system, utility rates, utility bills and weather data — is loaded as well. Where meter data is available, it is used. If it is not available, simulations using programs such as EnergyPlus are used to create an hourly energy balance for the installation over a typical year.

Selecting EMs

When a base case has been determined, the IPT automatically searches through its database of measures and applies them to the facility groups and systems of the base case. EMs are grouped into packages. Examples are: reduced infiltration (air leakage), high-efficiency lighting and high-efficiency chillers. EnergyPlus simulates each EM package for each facility type, a process involving hundreds of simulations that can take weeks for a subject matter expert when done by hand but only hours for the IPT.

For each package, default parameters fed to the simulation are typical values. These values can be changed by the user if conditions warrant. The IPT can select the best EMs based on energy performance and economics, and the user can create different alternatives that vary parameters such as fuel costs or EMs to be considered.

Distribution and supply

After the life-cycle cost-effective EMs have been applied to decrease load as much as possible, the IPT is ready to optimize distribution and supply. For heating and cooling, a completely decentralized option may be considered. The user can also identify clusters of facilities to be supplied by a central plant or by several smaller plants. As the user includes or excludes facilities, the IPT updates cluster load data.

For each cluster, the IPT begins with a database of all possible distribution and supply equipment that could satisfy electrical, heating, cooling and other loads. The definitions include regionally independent parameters such as efficiency, inputs, outputs, weather data and costs. Examples include advanced technologies such as gas engine and turbine cogeneration, solar, wind and biomass as well as more traditional solutions such as gas-fired boilers and diesel engines. The user can set constraints as well, such as a minimum mission-essential electrical power load, minimum fraction of renewable power and maximum allowable net fossil fuel usage.

The optimization process determines the lowest cost feasible suite of equipment by ensuring that the demands for heat, cooling, electric and other utilities are fulfilled for each of the 8,760 hours of the year while satisfying additional user-specified constraints. The user can create alternatives that include or exclude specific equipment, test sensitivity to various parameters or include completely decentralized options.

Way forward

Concurrent IPT demonstrations are in progress at West Point, Fort Leonard Wood and Portsmouth Naval Shipyard.




The IPT allows planners to evaluate building clusters to identify the right mix of different measures such as insulation, cogeneration, wind and solar power like this photovoltaic array at Fort Hunter Liggett, Calif. Photo courtesy of ERDC

These demonstrations involve teams of subject matter experts experienced in conducting integrated planning studies.

The goal is to explore how the best value can be derived from automated environments such as this IPT and to highlight elements of the analysis in which judgment and experience play a key role in producing a high-quality integrated plan. The IPT already has proven useful both because of the speed of computation and as a means to organize data needed in producing a baseline.

The demonstrations will be completed by October 2013, and the IPT will be made available to teams developing integrated energy, water and solid waste plans for Department of Defense installations. In addition, the ERDC Integrated Installation Energy, Water and Waste Modeling research program has developed water and waste measure data and experimented with simulation tools that will be integrated in future versions of this IPT, increasing the scope of plans that can be developed in the tool.

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When ‘building bridges’ creates another route for energy loss

by Axy Pagán-Vázquez

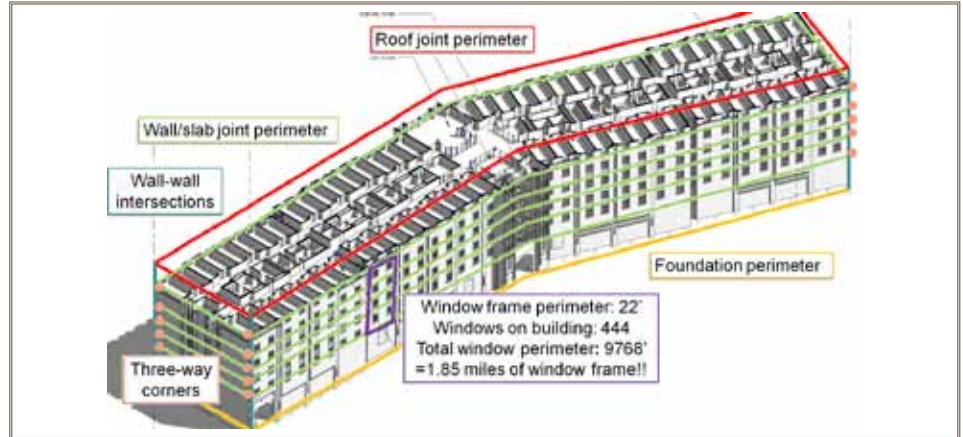
In seeking to help installations achieve their energy reduction goals, the Engineer Research and Development Center is developing guidance and modeling techniques to improve building envelope air barriers that can cut thermal losses by up to 45 percent. While investigating air barriers at several installations, another culprit emerged as a significant factor in energy loss — thermal bridges.

Thermal bridges are undesirable heat flow paths that occur in areas where structural components penetrate insulations, such as at intersections between walls and floors and among other dissimilar materials. They cause effects that can easily add up to 30 percent of the building envelope’s total energy losses.

The Army’s requirement for new buildings to achieve a Silver rating under the Leadership in Environmental and Energy Design system is resulting in the construction of high-performance buildings with more efficient building envelopes. However, these new designs often do not take into account preventive procedures to avoid thermal bridging effects, which become much more significant as building envelopes are highly insulated and air-sealed.

Researchers from ERDC’s Construction Engineering Research Laboratory visited several Army installations to study thermal bridging occurrence and severity in buildings. They selected different Army standard facility types to identify where and how thermal bridges occur, including tactical equipment facilities, company operation facilities, dining facilities and unaccompanied enlisted personnel housing.

In cooperation with the installation Directorates of Public Works, CERL



In this high-performance barracks image, potential thermal bridges are highlighted with lines, such as the roof (red), window frames (purple) and the foundation (yellow). Image by Jeffrey L. Lattimore, ERDC

inspected the buildings using an infrared camera. The IR images provided the big picture of where to look for thermal bridges. Then these high heat-loss locations were simulated in a computer program to quantify the severity of the effects with an estimate of the magnitude of the losses. These gross results provide a basis for consultants to develop remedial measures.

Among the conditions contributing to thermal bridge formation was the lack or improper placement of insulation in the building foundation. Also, windows without thermal breaks at their frames caused large energy losses. It was noticed that, although current construction projects have windows with high-performance glazing, a large percentage of the energy loss flowed through the highly conductive metal window frames. In the case of building foundations, it was almost inevitable to find thermal bridge losses. The IR camera images showed that most of the buildings surveyed had heat transfer at the outer wall, particularly close to grade level.


To document the implications of the thermal bridges discovered in the surveys, CERL conducted an additional study in one of the high-performance buildings. For this facility, the window frames’ thermal bridging effects were quantified. These

effects, known as “psi-values,” were used in a full building energy analysis.

The building had 444 windows, each with a perimeter of 22 feet, for a total of 1.85 miles of window frame. If thermal bridging effects were not prevented during construction, the energy losses would total nearly 1 billion British thermal units per year. Clearly, the best approach to mitigation is for the builder to pay attention to detail in the construction diagrams to avoid the formation of thermal bridges in the first place.

Energy loss through thermal bridges will affect new high-performance buildings if preventive action is not considered in the building envelope design. CERL is investigating proven and new means of mitigating thermal bridge effects. The results are expected to inform revisions to building standards including best practice protocols that will significantly reduce thermal bridge formation on new construction. Resolving this issue will be a major step toward reducing energy costs.

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Acronyms and Abbreviations

CERL	Construction Engineering Research Laboratory
ERDC	Engineer Research and Development Center
IR	infrared



Diagnostic system provides fast, accurate building leak detection

by Larry D. Stephenson and Jeffrey L. Lattimore

The U.S. Army Engineer Research and Development Center is demonstrating a new technology that enables rapid, high-resolution detection of building envelope energy losses. Developed by the Massachusetts Institute of Technology and Eye-R Systems with ERDC's support, the technology combines an innovative vehicle-mounted kinetic super resolution, long-wave infrared imaging system with conventional hand-held thermal imaging.

The imaging system is mounted on a van equipped with a controlling laptop computer, real-time viewing screens, data storage and a real-time GPS. The resulting multiple, staggered images are automatically time-synched with video feeds from the cameras, and the data is merged to greatly enhance the resolution of every pixel of the scene. The KSR technology allows rapid thermal imaging of multiple buildings in a way not currently possible with conventional thermography.

Building energy losses are often caused by missing or inadequate insulation and thermal bridges that are difficult to assess except by IR thermography. Thermal bridges account for about 10 percent of the energy loss in a typical building, and infiltration causes about 40 percent. Damaged or missing insulation accounts for another 40 percent, and the remaining 1 percent is due to energy loss through window glazing.

Because warm objects emit long-wave

IR radiation, IR thermography can help detect problems invisible to the naked eye. Examples are missing, damaged or improperly installed insulation within walls and roofs; thermal bridges; and poor seals. While conventional handheld thermography provides a detailed assessment of building envelope energy losses, it is a slow, meticulous process. KSR enables high throughput assessment of the energy loss from hundreds of building envelopes based on scans taken in just a few hours via drive-bys along the street where the buildings are located.

ERDC and MIT conducted super KSR thermographic and conventional thermography imaging at Fort Drum, N.Y., under the Installation Technology Transition Program sponsored by the Office of the Assistant Chief of Staff for Installation Management. The IR images are being combined with other imaging and structural information so that each detected energy leak can be automatically assigned a predicted energy cost, a parts-and-labor repair cost and recovered energy savings. The resulting data can then be presented on a Google Street View map of the installation that color-codes each building according to the amount of the calculated energy loss.

Since thermographic procedures must be conducted when inside and outside temperatures differ by at least 20 degrees Fahrenheit, the Fort Drum thermography scans were taken during the winter months.

Acronyms and Abbreviations	
ERDC	Engineer Research and Development Center
IR	infrared
KSR	kinetic super resolution
MIT	Massachusetts Institute of Technology

IR thermographic images were analyzed to quantify energy losses via infiltration, damaged building components, inadequate insulation and thermal bridges. Energy losses by large building clusters were quantified and mapped.

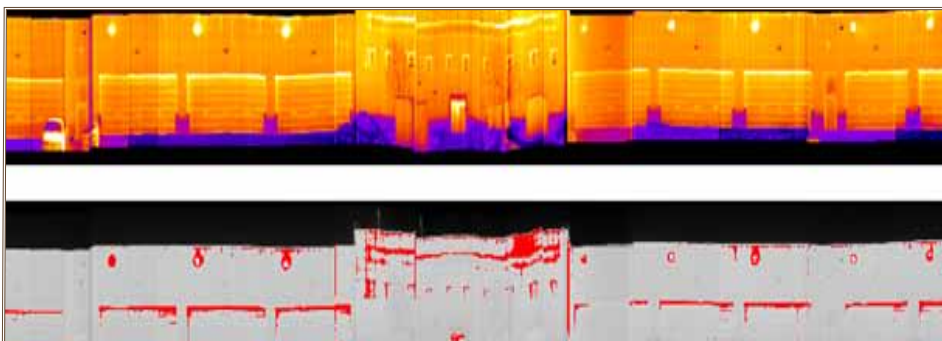
The results identify buildings that appear to have the greatest energy loss and need closer inspection, for example, by using conventional hand-held thermography and blower door tests. Using this information, the cost and benefits of upgrades can be determined more accurately.

Based on closer inspections, energy upgrades can be recommended, as is being done for a Fort Drum building for which thermographic images indicated energy losses around windows and doors and at steel seams and fasteners. The building could be retrofitted with an emerging insulation material, such as closed-cell spray polyurethane foam, and the building rescanned to compare energy losses before and after the retrofit. In this case, thermographic imaging serves as a quality assurance and control tool to validate that the retrofits work.

During the next year, ERDC will launch more demonstrations under the Department of Defense Environmental Security Technology Certification Program. Sites will include the U.S. Military Academy, West Point, N.Y.; Scott Air Force Base, Ill.; and Camp Lejeune, N.C.

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Larry D. Stephenson is a research metallurgist and materials scientist, and Jeffrey Lattimore is an engineering technician (materials), ERDC's Construction Engineering Research Laboratory, Champaign, Ill.



This composite image shows a thermal panoramic image (top) shot in a drive-by scan and an image of the automatically detected and segmented energy leaks (bottom). Image courtesy of ERDC



Energy, water technology demonstration programs offer opportunities

by Franklin H. Holcomb

Two technology demonstration and validation programs use Department of Defense installations as test beds — the Environmental Security Technology Certification Program and the Installation Technology Transition Program. These programs ultimately aim to improve energy security and to save energy and water. Both seek willing host sites, and getting involved is easier than you may think.

ESTCP funds two- to three-year projects

ESTCP is a DoD-funded program with the goal to, “identify and demonstrate the most promising innovative and cost-effective technologies and methods that address DoD’s high-priority environmental requirements.” For the past three years, an Energy and Water Program has been included to which both federal and nonfederal organizations can apply for grants. The proposer must work with a DoD installation that is willing to be a host site for the demonstration.

Areas of interest in the ESTCP Energy and Water Program include:

- technologies that support sustainable building design and operations, including innovative energy-efficient lighting, heating and air-conditioning systems;
- renewable energy, such as solar and wind power, and other distributed-energy generation sources;
- systems that enable better management of energy resources, such as improved energy storage and control techniques; and
- methods and technologies to reduce water demand.

ESTCP issues an annual call for

proposals, announced in the January timeframe. The call usually goes to Directorates of Public Works through garrisons following a distribution by the Installation Management Command.

After a series of reviews culminating with an oral presentation, successful projects are announced in the October timeframe. Funding is usually made available during the early part of the following calendar year. Typical projects are two to three years in duration, including site preparation, installation, operation and performance verification, and reporting.

A listing and description of the projects funded under the fiscal 2012 program can be found at <http://estcp.org/News-and-Events/News-Announcements/Program-News/Department-of-Defense-announces-new-installation-energy-technology-demonstrations-for-FY-2012>. This link includes information about past projects along with directions for responding to the solicitation.

Army representatives who participate in the ESTCP Energy and Water Program Technical Committee include Paul Volkman, Office of the Assistant Secretary of the Army for Installations, Energy and Environment; and this article’s author. Both can provide additional information on how Army garrisons can participate in this program. Contact the author at 217-373-5864 or Volkman at 703-697-3765.

ITTP demonstrates emerging technologies

ITTP is funded each year by the Office of the Assistant Chief of Staff for Installation Management to demonstrate technologies on Army and Army Reserve installations. Projects with the highest probability of being chosen for funding are



A Fort Wainwright air curtain firing range facility, demonstrated with ITTP funding, enables Soldiers to complete live-fire training in subzero temperatures. Photo by James Buska, ERDC

at locations run by U.S. Army personnel — not joint base locations run by another service on behalf of the Army — and address issues found at more than one Army installation.

As does the ESTCP Energy and Water Program, ITTP issues a call for proposals each year, but announced in the March timeframe. After a series of reviews, successful projects are announced in November. Funding is made available the following calendar year. All ITTP projects are a maximum of one year in duration.

An example of a recent ITTP demonstration involved emplacing an innovative air curtain facility at an outdoor firing range at Fort Wainwright, Alaska. Soldiers rotating through the fort need to complete a full schedule of training, which includes qualifying on their weapons at the firing ranges. In midwinter, due to the bitter and dangerously cold temperatures, the training is often delayed until warmer weather. The air curtain facility

Acronyms and Abbreviations	
DoD	Department of Defense
ERDC	Engineer Research and Development Center
ESTCP	Environmental Security Technology Certification Program
ITTP	Installation Technology Transition Program
OACSIM	Office of the Assistant Chief of Staff for Installation Management



Army announces \$7 billion contract to increase energy security

by Kathy Ahsing

Energy security is a top priority for the U.S. Army. In support of that objective and renewable energy goals, the U.S. Army Corps of Engineers' Engineering and Support Center, Huntsville, Ala., issued a multiple-award task order contract request for proposal Aug. 7. The resulting Renewable and Alternative Energy Power Production for Department of Defense Installations contract will be awarded to multiple firms based on their ability to finance, design, construct, operate and maintain renewable and alternative energy generation facilities on government property.

This MATOC RFP is unique, because the government will purchase renewable energy over a period of 30 years or less from contractors who will build, own, operate and maintain a generating facility on installations under DoD jurisdiction. The authority for this type of acquisition, known as a power purchase agreement, is derived from 10 U.S. Code Section 2922a, Contracts for Energy or Fuel for

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provides a barrier to the cold weather, making it tolerable for Soldiers to be outdoors for this critical activity.

Two other recently completed ITTP projects involved sustainment management systems. One tested admixtures for curing concrete at low temperatures, and the other demonstrated building integrated photovoltaics.

For questions about ITTP, contact the OACSIM program manager, Phil Columbus, at Philip.R.Columbus.civ@mail.mil, or Kelly Dilks at Kelly.M.Dilks@us.army.mil.

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Military Installations.

By acquiring on-site renewable energy capabilities using private sector financing, installations can realize the benefits of locally produced energy by procuring energy through their utility budgets without competing for scarce Military Construction appropriations or incurring facility maintenance and repair burdens. When a privately owned facility has energy-generating capacity greater than the installation's needs, it can sell the excess to other customers, a win-win situation.

Huntsville Center chose a MATOC to provide small and large businesses a contract vehicle to develop solar, wind, biomass, geothermal and alternative renewable energy projects. Individual task orders for PPAs will be developed based on an installation's requirements and then solicited among the pool of prequalified contractors. The MATOC will support \$7 billion in competitive PPAs over its 10-year life.

More than 600 representatives from industry attended a preproposal conference Aug. 22 in Huntsville. Participants received an overview of the procurement process and specifics about the MATOC RFP. Presentations and video from the conference are posted on the Energy Initiatives Task Force's website, www.armyeitf.com, and the Huntsville Center website, www.hnd.usace.army.mil. The conference included a question-and-answer session, which was posted on Federal Business Opportunities as an amendment to the solicitation.

Huntsville Center developed the MATOC RFP in collaboration with the EITF, which was established by the Secretary of the Army to serve as the central management office for Army installations to generate cost-effective, large-scale renewable energy projects through private sector partnering. The task force focuses on wind, solar, biomass and geothermal renewable energy projects that are 10 megawatts or greater and located on



John Lushetsky, executive director, EITF, speaks at the preproposal conference for a \$7 billion shared capacity renewable and alternative energy MATOC. Photo by William Farrow

Army installations in the United States.

The EITF expects to use the MATOC as one of its primary acquisition vehicles to develop large-scale renewable energy projects on Army lands. The MATOC may also be used by installations and other DoD organizations for both small- and large-scale renewable energy power purchase agreements.

This effort demonstrates the Army's commitment to installation energy security, mission readiness and resilience, and reaffirms the Army's determination to lead the nation in adopting and developing clean and renewable energy.

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Kathy Ahsing is the director, Planning Division, U.S. Army EITF.

Acronyms and Abbreviations	
DoD	Department of Defense
EITF	Energy Initiatives Task Force
Huntsville Center	U.S. Army Engineering and Support Center, Huntsville
MATOC	multiple-award task order contract
PPA	power purchase agreement
RFP	request for proposal



Guide for high-performance buildings available

by Rosemarie Bartlett

The American Society of Heating, Refrigerating and Air Conditioning Engineers published a new guideline, 32-2012, *Sustainable, High-Performance Operations and Maintenance*. ASHRAE 32-2012 applies to new and existing commercial, industrial and laboratory buildings, and provides guidelines to making those buildings high performers.

A high-performance building is defined in the guideline as having “safe, productive indoor environments; low economic life cycle cost; low energy, water, and resource use and low impacts on the environment.”

Operations and maintenance staff who work with heating, ventilation and air conditioning equipment may be familiar with Standard 180, *Standard Practice*

for Inspection and Maintenance of Commercial Building HVAC Systems, a combined standard from the American National Standards Institute, ASHRAE and the Air Conditioning Contractors of America. ASHRAE Guideline 32-2012 is meant to provide the next steps. The guideline is also intended to meet the minimum standards of care for Standard 189.1, *Standard for the Design of High Performance Green Buildings*, from ANSI, ASHRAE, the U.S. Green Building Council and the Illuminating Engineering Society.

ASHRAE 32-2012 focuses on steps required to transition from normal O&M to high-performance O&M. The topics are organized by audience — senior management, facility managers and technicians — with specific actions listed for each audience. For example, the first step for senior management is to establish support from the top of the organization. Facility managers are charged to implement the changes. Technicians have to move from being reactive to

“ASHRAE 32-2012 focuses on steps required to transition from normal O&M to high-performance O&M.”

being proactive.

The guideline provides checklists that summarize the content for each group. Several informative annexes offer additional information, such as resources, tools and techniques, tips on surveying occupants, training needs assessment, training information, HVAC energy-savings opportunities and sample checklists for high-performance systems.

The guideline is available for purchase at <http://www.techstreet.com/ashrae/ashraegate.html>.

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Rosemarie Bartlett is a project manager, Energy and Environment Directorate, Pacific Northwest National Laboratory.

Acronyms and Abbreviations	
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
HVAC	heating, ventilation and air conditioning
O&M	operations and maintenance

Federal facilities maintenance, repair report calls for action

by Rosemarie Bartlett

Those involved in maintaining and repairing federal facilities may be interested in a recent report by the National Academy of Sciences and the Federal Facilities Council, *Predicting Outcomes from Investments in Maintenance and Repair of Federal Facilities*.

The council commissioned the study because of current economic conditions, inadequate operations and maintenance funding, and the belief that most buildings used today will be used for at least 30 more years. As of 2011, more than 429,000 buildings are either owned or leased by the federal government in addition to nearly 500,000 additional structures, e.g., roads and bridges. A committee comprising facilities management experts from

the public and private sectors and academia was appointed to study the issue.

The study’s conclusion is that maintaining and repairing federal facilities is a complex problem and no one answer will solve it, but new approaches are needed. Specific outcomes and associated adverse consequences from different levels of investment must be made clear to decision makers. Targeted investments can then be made based on potential risk.

The study contains seven recommendations, described in more detail in the report.

- The federal government should engage in a coordinated effort to dispose of facili-

“The study’s conclusion is that maintaining and repairing federal facilities is a complex problem and no one answer will solve it, but new approaches are needed.”

ties that are not needed and to reduce the total footprint needed through methods such as alternative work strategies.

- Agencies should set specific investment priorities and include methods to measure performance.
- Agencies should develop a 5- to 10-year plan, use a risk-based process to determine specific activities and establish methods to collect data to measure outcomes.



Forum connects fuel cell experts, installations

by Nicholas Josefik and Stephen Hammill

The newly created Fuel Cell End Users Forum supports Directorates of Public Works and other decision makers in determining fuel cell applicability at Department of Defense installations. The forum was established by a partnership involving the Engineer Research and Development Center; the Department of Energy; the U.S. Army Tank Automotive Research, Development and Engineering Center; and industry representatives.

The partnership allows potential, prospective, current and former DoD fuel cell users to interact as a peer group in efforts to integrate fuel cell solutions into their environments. The forum's government and industry experts conduct quarterly webinars on topics proposed by participants, serving as a user-focused venue for sharing information.

The forum is governed by the needs of the attending user community, and its agenda is developed based on user and stakeholder feedback. It provides unbiased information from experienced government users on:

- backup power fuel cell units,
- prime power fuel cell units,
- installation codes and standards,
- permitting requirements,
- hydrogen and fuel cell safety,
- cost savings opportunities,
- energy security benefits,
- determining host site power requirements,

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- Facility managers should communicate clearly with all levels of decision makers regarding investments and outcomes.
- Agencies should collaborate to develop measures for outcomes and standardized practices that could be used throughout the entire federal government.
- Agencies should focus on data that's already available.

- fuel options,
- case studies, and
- coordinating projects among facility departments.

Previous webinars have focused on issues that affect the installation of fuel cells at DoD facilities and how DPWs can overcome them to create a successful fuel cell deployment. One case study spotlighted the installation and successful multi-year use of fuel cells at Fort Jackson, S.C., detailing the lessons learned and benefits realized by building occupants.

Members of the Fuel Cell End Users Forum can also access previous presentations, reports, fact sheets, lessons learned and points of contact. This online repository can aid in searching for information and understanding fuel cells, and the site creates a pipeline to industry to determine what the new trends are in fuel cell technology. Users will also be able to talk directly with industry and have any questions or concerns answered about new or existing products and their possible applications.

You can access the website at www.fchea.org/index.php?id=89

- Agencies should collaborate to develop rapid and effective data-collection methods.

The report is available at http://www.nap.edu/catalog.php?record_id=13280.

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Is a fuel cell the right choice for your installation? The forum can help you decide. Photo by Dana Finney, ERDC

or contact the POCs listed below.

The Fuel Cell End Users Forum is developing to become the premier location for fuel cell knowledge and experience support for DoD site personnel. Join the peer-to-peer supported group to spread the knowledge and experience of fuel cell use and to engage with both experts and experienced users on a wide variety of topics. The forum arranges quarterly webinars with industry and government experts, and participation is free.

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Nicholas Josefik and Stephen Hammill are researchers, ERDC's Construction Engineering Research Laboratory, Champaign, Ill.

Acronyms and Abbreviations

DoD	Department of Defense
DPW	Directorate of Public Works
ERDC	Engineer Research and Development Center



Are you in a Civilian career program?

by Donna Crawford

Prior to the summer of 2011, only 40 percent of Army Civilians were members of one of the 23 Army Civilian Training, Education and Development System career programs. Since then, that situation has changed dramatically.

As part of the Civilian Workforce Transformation initiative, the Army G-1, in coordination with the assistant secretary of the Army for manpower and Reserve affairs and other Army staff elements, developed a comprehensive, integrated plan consisting of five lines of effort. Each line of effort includes a series of critical tasks designed to address long-standing challenges to Civilian workforce management. They also address National Defense Authorization Act 2010 requirements.

One of these lines of effort, number two, is intended to improve Civilian workforce life-cycle strategy, planning and operations to enhance mission effectiveness. Under this effort, all Army Civilians will be aligned to an existing or new CP. The

desired result is to cover 100 percent of the Army Civilian workforce.

What does this mean to you? Under Army Regulation 690-950, Career Management, the Army structures CPs using ACTEDS. ACTEDS is a requirements-based system that ensures planned development of Civilian workforce members through a blending of progressive and sequential work assignments, formal training and self development as they progress from entry level to key positions. ACTEDS seeks to assure the systematic development and sustainment of the Army's Civilian workforce and the development of technically competent and confident Civilian leaders essential to Army readiness.

Today, there are 31 CPs. Each has a functional chief, a functional chief representative and a proponent office led by a director. Each CP is responsible for developing and maintaining its associated ACTEDS plans and communicating training and development efforts to its Armywide workforce.

Army Civilian Career Programs

CP10 Civilian HR Management	CP11 Comptroller	CP12 Safety & Occupational Health	CP13 Supply Management	CP14 Contracting & Acquisition
CP15 Quality & Reliability Assurance	CP16 Engineer & Scientist (Non-Construction)	CP17 Materiel Maintenance Management	CP18 Engineers & Scientists (Construction)	CP19 Physical Security and Law Enforcement
CP20 Quality Assurance Specialist (Ammo Surv)	CP22 Public Affairs & Communications Media	CP24 Transportation Management	CP26 Manpower & Force Management	CP28 Equal Employment Opportunity
CP27 Housing Mgmt	CP29 Installation Mgmt	CP31 Education Services	CP32 Training, Capabilities & Doctrine Warfighting Dev	CP33 Ammunition Management
CP34 Information Management	CP35 Intelligence	CP36 Modeling & Simulation	CP50 Military Personnel Management	CP51 General Administration & Management
CP53 Medical	CP55 Inspector General	CP56 Legal	CP 60 Foreign Affairs & Strategic Planning	CP61 Historian/Museum Curator
CP64 Aviation				

Each CP develops its ACTEDS plan using formal or informal job analysis techniques to identify required competencies — knowledge, skills and abilities — at the five major stages of career advancement — intern, specialist, supervisor, manager and executive. The competency requirements serve as the basis for ACTEDS plans that include: identification

Acronyms and Abbreviations	
ACT	Army Career Tracker
ACTEDS	Army Civilian Training, Education and Development System
CP	career program
CP-18	Career Program 18, Engineers and Scientists – Resources and Construction
FC	functional chief
FCR	functional chief representative

of key positions, career ladders showing vertical and horizontal progression paths to key positions, training and recommended education, recommended self development and a master training plan as well as a master intern training plan where applicable.

The ACTEDS plan's intent is to provide a holistic approach to Civilian career development through a combination of Civilian leader development courses, professional and technical training, progressively more responsible job assignments and self-development.

The Army's goals for ACTEDS are:

- develop broad gauged, multi-disciplinary Civilian executive talent in complex fields such as acquisition, logistics, installation and information management, and research and development;
- ensure consistent quality across occupations through planned career development of Civilian employees from entry to senior executive levels;
- ensure technical proficiency at each progression level; and
- offer an opportunity for growth and development for those individuals with high potential for advancement.

So, how do you identify your career program? Every position has a four-digit number that identifies its job classification. For example, job series 0810 is "civil engineer." Your alignment to a CP is determined by how your series relates to the work being done by like or related series.

The number of series included and the total population varies by CP. CP



Take a walk with G4

by Jill Reilly

The heat and humidity did not deter Army leaders from taking a stroll around the Installation Management Command campus on Fort Sam Houston, Texas, during the Garrison Leaders Course in July.

As part of the curriculum, IMCOM G4 Public Works provides a session on the important aspects of master planning, facilities management, housing, energy and utilities, business operations and the environment. In the past, this information was briefed in the classroom, but starting in July, G4 took it outside. A mile-long course around the IMCOM campus provided examples of the good and not-so-efficient ways Public Works supports garrison infrastructure.

The tour began at the IMCOM Academy, a new facility on the IMCOM campus built to Leadership in Energy and Environmental Design Silver standards. Moving outside, the tour wound around the campus's main quad, highlighting how the old buildings were renovated to preserve their South Texas architecture and how the new buildings mimic the same roof and wall colors and window structure.

Participants were shown storm-water and erosion controls, sidewalk and road maintenance, energy improvements, base housing and significant historic and cultural settings. The tour focused on the importance of annual work plan requirements and identifying "marginally correct" areas for improvement.

After returning to their installations, garrison commanders and other installation leaders who participated in the tour are better equipped to walk around their installations with their directors of Public Works and discuss what improvements need to be done.

Feedback from the July course

automatic. A detailed listing of what series can be aligned to which CPs is found at <http://cpol.army.mil/library/train/acteds/>.

You can determine exactly to which career program you are assigned by signing into Army Knowledge Online and accessing the Army Career Tracker portal at <https://actnow.army.mil>. Select the "My Career" tab to see the career program indicator. You can read more about ACT in the Professional Development section of the May/June 2012 Public Works Digest.


Become familiar with your CP and the training and development tools available to you. Learn who your FC, FCR and



Qaiser Toor, IMCOM G4 Energy Division chief, explains energy saving initiatives to Garrison Leaders Course students during a walk with G4 representatives at Headquarters IMCOM, Fort Sam Houston. Photo by Jill Reilly

evaluations was positive, and G4 plans to continue the Public Works tour as part of the course.


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Jill Reilly is a program manager, Environmental Branch, Public Works Division, Headquarters IMCOM, 

proponency office team members are. This information is posted in ACT and in the ACTEDS catalog, Chapter 3. You can also learn more about each of the Army Civilian CPs by reviewing the ACTEDS Training catalog at <http://cpol.army.mil/library/train/catalog/toc.html>.

If you have questions or concerns about your CP, contact your CP proponency office or your human resources specialist.

POC is Donna Crawford, 202-761-7493, cp18proponencyteam@usace.army.mil.

Donna Crawford is the director, CP-18 Proponency Office. 

Acronyms and Abbreviations

IMCOM	Installation Management Command
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18, Engineers and Scientists, Resources and Construction, comprises 108 series and about 27,000 Civilians. Some of these series are unique to CP-18 and are not found in any other CP. Some series are shared with other CPs. For example CP-16, Engineers and Scientists, Non-Construction, also has 0810 civil engineers.

Individuals in historically administrative series, such as 0301, miscellaneous administration, or 0340, program manager, may also be aligned to a CP based on the business rules determined by each FCR; however, inclusion is not



Totorica is energy team lead at IMCOM

by Mary Beth Thompson

The Army's focus on energy means energy is a field in which people can make a difference, according to Ralph Totorica, team lead for energy in the Energy and Utilities Branch, Public Works Division, Headquarters Installation Management Command.

"Energy is a very important issue, and it's a rewarding area to work during these times," Totorica said.

His advice to Directorates of Public Works? Acquire a champion for the effort.

"The number one thing in an energy program is to get yourself a good, motivated energy manager," Totorica said. "There has to be a point person at the garrison who has a passion for energy and will take the ball and run with it, someone who is competent and able to support projects and give updates to leadership on what needs to be done."

As IMCOM's lead energy engineer, Totorica ensures garrisons comply with federal laws, executive orders, and Department of Defense and Army energy and water requirements.

Totorica and his team oversee programs that contribute toward meeting energy and water goals, such as Sustainment, Restoration and Modernization funding for energy and utilities projects, the Energy Conservation Investment Program, Energy Savings Performance Contracts, energy audits, energy awards, metering, renewable energy and water conservation. He directly manages energy awareness and conservation assessments, which his team has increased from 12 to 24 a year.

"Basically, our job at the headquarters level is to ensure that the garrisons have the tools and the guidance that they need to be successful in execution," he said.

Totorica brings a high level of personal energy to the job. The self-described "fitness nut" enjoys many sports with his family. He runs, bikes and plays golf and tennis.



Ralph Totorica
Photo by Owena Yang-Totorica

"Especially playing tennis," Totorica said. "If you don't find me at work or at home, I'm probably out on the tennis courts playing in various leagues."

A career Army engineer, Totorica first focused on the Army's energy efforts in 2004 when he became Western Region energy manager for the Installation Management Agency, the forerunner to IMCOM.

He worked in that capacity at Fort Sam Houston, Texas, for four years before moving to Europe Region as the lead facilities engineer. After two years, Totorica returned to San Antonio to become IMCOM's energy team lead.

He is a registered professional engineer and completed the Army Management and Staff College's Sustaining Base Leadership and Management course. He furthered his energy expertise by earning certified energy manager status.

Totorica had earlier lived in Europe, working in U.S. Army Europe's Deputy Chief of Staff for Engineering office. During his four years there, IMA was formed, and Totorica became part of IMA's Facilities Engineering Branch working on water, wastewater, solid waste and recycling programs.

Before then, he had worked at the Corps of Engineers' Seattle District on environmental cleanup projects for eight years.

Acronyms and Abbreviations

IMA	Installation Management Agency
IMCOM	Installation Management Command

His bachelor's degree in mechanical engineering is from the University of Idaho. After earning his master's in environmental engineering from the University of Washington, Totorica began his Army civilian career with Seattle District.

Working energy improvements on Army installations is rewarding but not easy, Totorica said. Resources will always be the challenge.

"We're never going to have the resources we need to do everything that we want to do," he said, "so what we're trying to do at IMCOM is to focus what resources we have on those programs and projects that are going to give us the most bang for the buck — the projects that return the investment very quickly in energy and water savings.

"Even then, we'll never have the resources to do all the good payback projects we want to do, so we're also trying to incorporate private financing projects to execute our energy projects," he said. "Our challenge there is to do our due diligence reviews to make sure that the Army is getting good business deals out of those private financing contracts."

When interviewed, Totorica and his team were projecting requirements for energy and utility projects three to seven years into the future.

"We're working with regions and garrisons to get projects identified [and] prioritized, again looking at those projects that are going to give us good return on investment and laying those out in future years into a coordinated program," he said.

The team was also reviewing garrison submissions for the Department of Energy *Better Buildings Award*. The award program, a year-long competition during which federal agencies compete against



Who replaces Bill Eng?

by Jim Gill

Most of the folks who work with Army solid waste, recycling and water conservation efforts knew long-time waste and water expert Bill Eng. Eng covered those areas in the Office of the Assistant Chief of Staff for Installation Management's Facilities Policy Division for 17 years until he retired in June 2011.

During his tenure as the senior program manager for the Water, Solid Waste and Recycling programs, Eng's expertise resulted in a 15 percent reduction in water consumption across the Army and an increase in nonhazardous materials recycling of 40 percent, diverting those materials from Army landfills.

After his retirement, Cecile Holloway stepped in to take over Eng's responsibilities until a permanent replacement could be named.

Holloway handled the day-to-day administrative requirements to keep those programs moving and initiated improvements to the Solid Waste Annual Reporting system known as SWARWeb. In addition, she worked with Pacific Northwest National Laboratory to develop training software targeted at new users of the system.

Holloway also began to develop an Armywide template to aid installations in developing their water management plans



Jim Gill
Photo by Cecile Holloway

The template is meant to guide as well as lessen the installations' workload as they develop their water management plans and work to lower their potable water usage as required by Executive Order 13514.

That summary brings us to today. I am the permanent replacement for Eng and Holloway.

I earned my bachelor's degree in mechanical engineering from Ohio State University, and I have nearly 30 years experience in research, development, design and construction engineering.

Most recently, I worked for the Department of Veteran Affairs as an assistant chief engineer for the Louis A. Johnson Medical Center in Clarksburg, W.V. In that capacity, I managed the Engineering, Bio-Medical, Safety, Industrial

and Environmental Services departments.

As the manager of environmental activities, I led efforts to minimize waste going to landfills and was a key player in the center's water and water conservation efforts.

I am in the learning mode about Army installations and procedures, but I am no stranger to waste and water issues and am ready to help out where needed. I can answer policy questions from experience or will find a source, whether internal or external to the Army, who can answer the question.

I can be contacted at 571-256-9765 or james.d.gill33.civ@mail.mil.

Jim Gill is the senior program manager, Water, Solid Waste and Recycling programs, Facilities Policy Division, Office of the Assistant Chief of Staff for Installation Management.

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one another on energy performance after certain energy improvements have been made to a structure. At the end of fiscal 2013, the building that achieves the best energy savings will get the award.

"It's something new each week," Totorica said. "There's a lot of activity in the energy program."

Totorica and his energy team are helping garrisons fulfill their energy requirements, making a difference, not only for the Army but also for the nation.

Mary Beth Thompson is the managing editor, Public Works Digest.

From the editor

This is my last Public Works Digest. I loved editing and producing the Digest, and now I plan to enjoy retirement. Thank you for all of your input over the years. It is you, the Army Public Works community, who make this magazine a great resource.

My first editor's note began with greetings in some of the many languages of Installation Management Command post locales, so I will conclude with goodbyes in a similar vein: *aufwiedersehen*, *ciao*, *sayonara*, *annyeong-hi kyeshipshio*, *aloha*, so long. But more than simple farewells, I also send the Army Public Works community good wishes for things to come. Perhaps Dale Evans said it best, "Happy trails."

Mary Beth Thompson
Managing Editor

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