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U.S. ARMY INSTALLATION MANAGEMENT COMMAND

IMIGOM



Alternative fuels are part of the solution at Fort Hood, Texas, where Alvin Cobbs, a transportation motor pool bus driver, fills his bus with biodiesel at the automated fuel service station. Photo by Christine Luciano. Page 35

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Energy security: a leadership perspective

by Brig. Gen. Dennis E. Rogers

Over the past year, the issue of energy security has become increasingly important to the nation and the mission of the Department of Defense. In the news, we are constantly reminded about the severe consequences of our reliance on imported oil — and deservedly so. We also read about how fragile the nation's electricity grid has become; and this at a time when our fascination with all things electronic seems insatiable.

Today, I am focusing on energy security in the context of facility energy. I will begin by looking back.

In December 1998, as a young lieutenant colonel, I was commander of the 4th Battalion, 64th Armor Regiment, 3rd Infantry Division charged with the important mission of establishing a base camp as part of Operation Desert Fox in Iraq. I share this experience to draw a correlation between the challenges I faced then and the ones our garrison energy managers see today. Specifically, I want to discuss how we can improve energy security by doing the simple things, like reducing energy consumption.

The hurdles I faced may sound familiar — limited resources and staff, hard deadlines and reporting, and, worst of all, “they” wanted it yesterday. To establish a base camp out of the Iraqi desert, our first challenge was to “secure the dirt.” This may sound funny, but, believe me, it was a critical step in the process. Over a period of a few days, water trucks went back and forth across the proposed camp area, which covered seven square kilometers. Now, that's a lot of dirt and a whole lot of water.

Having established our “foundation,” we proceeded with laying out the grid of our temporary tent city, a very organized city. The first hurdle we ran into was how to get the utilities to the many residents. I had a problem with providing a readily available answer, so I improvised. Sound familiar?

Electricity was generated by deploying numerous diesel-fueled generators located as close to the load centers or users as possible. One challenge, if we sited the gen-



Brig. Gen. Dennis E. Rogers
U.S. Army photo

erators too close to the users, was the noise and fumes they created. Another hard lesson that we needed to address was the delivery of fuel to the generator sets. Again, we improvised and decided on establishing strategically located fuel corners that would allow easier distribution to the load centers.

Fast forward to April 2003, I was the commander of 2nd Brigade Combat Team, 4th Infantry Division (Mechanized), charged with establishing another base camp as part of Operation Iraqi Freedom. We followed the same process as in '98 and achieved the same predictable results.

The operation was a success, but in hindsight, there were many things we could have done differently to conserve energy while improving the overall efficiency of the camp. Maybe at your garrison, you have run into this challenge: “That's the way we have always done it.”

Now in 2009, as the G3 Installation Management Command, I've had the pleasure of meeting with many of our garrison energy managers, who I know are faced with increasingly challenging working conditions. My advice continues to be to use your ingenuity to solve your problems; improve to get the job done.

Based on insights I have gained over time, I realize in retrospect that, if we had developed and operated the base camps differently, we could have reduced our energy consumption thereby improving the security of supply. As a battalion commander, I would have considered how to

reduce the camp's reliance on diesel fuel through the use of renewable energy and cutting-edge practices like tent foaming and converting the trash we created into fuel. To reduce the fuel burden and save Soldiers' lives, the camp could have also integrated low-speed electric vehicles into its vehicle fleet.

These are sound solutions and represent the type that we are pursuing under an enterprisewide energy strategy.

Last year, the Army brought in some smart folks to address the number of energy challenges facing us. The outcome was for the Army to address energy security for our garrisons through the *Army Energy Security Implementation Strategy*, which balances current legislation and policies against the need to deliver a comprehensive solution for energy security.

The strategy identifies five key characteristics of energy security: surety, supply, sufficiency, survivability and sustainability. Unfortunately, energy security is an increasingly complex topic and is interpreted differently by different people.

To be clear, energy security for the Army means preventing the loss of access to power and fuel sources (surety), ensuring resilience in energy systems (survivability), developing alternative and renewable energy resources on installations (supply), securing adequate power for critical missions (sufficiency), and promoting support for the Army's mission, its community and the environment (sustainability).

Under the strategy, there are five clearly stated energy security goals that were designed to advance the Army to a higher level of energy security and, let me be clear, to be achieved over the long term. We are not in a hurry like I was setting up the base camps. In fact, to insure that the five energy security goals are achieved, we have established a set of metrics that will be measured annually to track our progress.

As a Soldier who has served in theater and was tasked with specific missions, ➤



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I can clearly state that the pursuit of these goals will not lead to a reduction in operational capability or the ability for the Army to carry out its primary missions. Furthermore, the strategy being considered to achieve these energy goals will effectively maintain and enhance operational capabilities, achieve long-term cost savings and strengthen the ability of the Army to fulfill its missions.

Acronyms and Abbreviations

DSB	Defense Science Board
ESG	energy security goal
FY	fiscal year
IMCOM	Installation Management Command
LEED	Leadership in Energy and Environmental Design

Implementation of the strategy will be accomplished through the *Army Energy Security Implementation Plan*, which details the specific objectives and metrics under the guidance and direction of Dr. Kevin Geiss, program director, Energy Security, Office of the Assistant Secretary of the Army for Installations and Environment.


Achieving each of these goals will require additional resources. Paul Volkman, IMCOM Energy and Utilities Program manager, participated in a working group tasked with defining the specific activities required to achieve the goals and the corresponding levels of funding. The strategy has been briefed to the senior Army leadership. The next step will be to begin the budgeting process to request the additional

funding required to staff and implement the strategy.

In the meantime, we still have a job to do.

The bottom line is, when you are facing what appears to be an insurmountable problem, improvise. There is always a workable solution available; it may just require a little ingenuity. As the Army does, we lead from the middle as we address not only our energy challenges but the nation's as well.

Thank you for what you do for our troops by making our garrisons better places to live, train and raise Families.

Brig. Gen. Dennis E. Rogers is the director, National Capital Region District, and director, Operations and Facilities, IMCOM. 

Why does Army need an energy strategy?

by Brig. Gen. Dennis E. Rogers

The Department of Defense posed the question, "Does the Army need an energy strategy?" to the Defense Science Board a few years ago. The answer was unexpected and startling. Under the report *More Fight – Less Fuel*, the DSB identified multiple energy vulnerabilities and provided recommendations.

The *Army Energy Implementation Security Strategy* strives to address a number of the vulnerabilities, specifically, finding number two, which states, "*Critical national security and Homeland defense missions are at an unacceptably high risk of extended outage from failure of the grid. In addition to their warfighting responsibilities, installations have taken on significantly expanded Homeland defense missions. ... They rely almost entirely on the national power grid and other critical national infrastructure, which is highly vulnerable to prolonged outage from a variety of threats, placing critical missions at unacceptably high risk of extended disruption. Backup power is often based on diesel generator sets with limited on-site fuel storage, undersized*

for new Homeland defense missions, not prioritized to critical loads, and inadequate in duration and reliability."

Under the strategy, five energy security goals address the energy vulnerabilities identified by the DSB at fixed installations. Achievement of these ESGs should improve the energy security posture for Army installations as well as comply with federal energy regulations and Army energy policies. Let me assure you that the strategy does not represent another report. It has been briefed to the secretary of the Army and has his full support.

Implementation of the strategy will be accomplished through the *Army Energy Security Implementation Plan*. The plan provides a detailed approach, measured by clear metrics and objectives, to reach each ESG in the desired time frame.

Let me be clear, the plan is not an unfunded requirement. Brig. Gen. Al Aycock, the deputy commanding general, IMCOM, and I have stated clearly that, without additional funding, the activities defined in the plan cannot be pursued or accomplished.

The plan was developed through a collaborative process involving several working groups. IMCOM was fully engaged in the process from the outset to represent our customers and Soldiers. I was briefed regularly on our efforts and am pleased with the final work product. Specifically, let me recognize Paul Volkman for all the hard work and countless hours he put into this effort in addition to performing his regular duties as program manager for Energy and Utilities.

I call your attention to a few of the important activities for each ESG:

ESG 1 – Reduce energy consumption:

- Complete comprehensive energy and water master plans.
- Provide full-time, trained and certified energy manager at every installation.
- Develop energy training and certification program.
- Improve the Army Energy and Water Reporting System.
- Install utility monitoring management systems. ➤



USACE supports Army Energy Security Implementation Strategy

by James C. Dalton

Drawing on the work of the Army Energy Security Task Force, established by former Secretary of the Army Pete Geren in April 2008, the *Army Energy Security Implementation Strategy* was developed. The AESIS represents a fundamental paradigm shift to address the energy security challenge through newly established central leadership and integrated, goal-driven energy activities.

New, centralized leadership has been established with formation of the Army's



James C. Dalton
Photo by F.T. Eyre

The energy security goals are:

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

The two-star equivalent Advisory Board serves a senior validation role for those assessments and identifies issues that require resolution by the SEC. Maj Gen. Jeffrey Dorko, deputy commanding general, Military and International Operations, represents the U.S. Army Corps of Engineers on this board.

The Headquarters, USACE Installation Support Community of Practice represents USACE in the SEC Work Group, which develops objectives, metrics and an implementation plan. The ISCoP works with ►

Acronyms and Abbreviations	
AESIS	Army Energy Security Implementation Strategy
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
CERL	Construction Engineering Research Laboratory
EPAct 05	Energy Policy Act of 2005
ERDC	Engineer Research and Development Center
ISCoP	Installation Support Community of Practice
SEC	Senior Energy Council
USACE	U.S. Army Corps of Engineers

three- and four-star equivalent Senior Energy Council and the deputy assistant secretary of the Army for energy and partnerships to integrate and focus the Army's energy activities to support five strategic energy security goals across the Army enterprise.

The SEC has set the overall energy security strategy and goals for the Army through the development and revision of the AESIS.

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- Develop program to modernize installation utility infrastructure.
- Create energy savings retention accounts for installations.

ESG 2 – Increase energy efficiency across platforms and facilities:

- Create program to verify that all constructed and renovated buildings comply with energy requirements of statutes and Army policy.
- Develop and staff new project validation team to evaluate 10 percent of new construction and renovation projects.
- Obtain full official Leadership in Energy and Environmental Design certification for all new building construction and renovations at the appropriate LEED level.
- Provide LEED training and certification to energy managers and designers.

ESG 3 – Increase use of renewable energy:

- Conduct renewable energy assessments.
- Stand up centralized renewable energy projects development support team.
- Provide technical assistance to advance the development of renewable energy projects.
- Support development of on-site renewable projects that achieve 7.5 percent of annual consumption by fiscal year 2013, 25 percent by FY 2025 and 50 percent by FY 2030.

ESG 4 – Assure access to sufficient energy supply:


- Prepare energy security plans for all garrisons.
- Review energy security and reliability considerations with utility suppliers.
- Ensure all energy managers possess appropriate security clearance.
- Provide guidance concerning meeting

with energy and utility providers to annually review security and reliability issues.

- Create net-zero implementation plan.
- Develop 1,500 megawatts of new renewable energy supplies.

ESG 5 – Reduce adverse impacts on the environment:

- Create enterprisewide strategy for reducing greenhouse gas emissions at installations.
- Develop greenhouse gas training program.
- Optimize water use to reduce consumption.

The energy landscape is changing almost daily. To insure the strategy and corresponding energy security goals remain current, the strategy will be reviewed regularly and will be revised as required. 



Improving Army energy security is top priority

by Kevin Geiss

October is Energy Awareness Month, and the Army will highlight the growing need to improve its energy security posture. Without secure energy supplies when and where needed to meet mission requirements, the Army cannot do its job at home or abroad. Vulnerable fuel or electricity supplies can jeopardize the ability to support domestic and contingency forces, making secure energy an essential ingredient across the Army enterprise. Energy security is a fundamental element of national security.

Energy security refers to the level of assurance that critical installation and operational unit missions can achieve in the face of disruptions to electricity or fuel sup-

Beans, bullets and Btu's

This motto, revised from the older "Beans, bullets and bandages," emphasizes the critical importance of energy to Army operations.

plies. Increasing energy security enhances the readiness, effectiveness and sustainability for combat forces and ensures that the Army can respond to mission requests and accomplish mission objectives.

As the five Army energy security components are addressed at installations, in deployed operations and in support of weapons systems, the Army can improve

its state of energy security — but changes must not lead to reductions in operational capability or the ability of the Army to carry out its primary missions. Last year, the Army established the Office of the Deputy Assistant Secretary for Energy and Partnerships within the Office of the Assistant Secretary for Installations and Environment to facilitate these kinds of developments.

To solidify the senior leadership on energy security the secretary of the Army and the chief of staff of the Army

Acronyms and Abbreviations

ASA-I&E	assistant secretary of the Army for installations and environment
FOB	forward operating base

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other Headquarters, USACE, elements to develop and execute the implementation plan.

USACE has been intimately involved in supporting AESIS. Beginning with fiscal year 2008 projects, the Energy Policy Act of 2005 requirements for electrical metering, Energy Star and Federal Emergency Management Program-rated equipment, premium efficiency motors and overall energy performance that is 30 percent more efficient than required by American Society of Heating, Refrigerating and Air Conditioning Engineers 90.1 have been incorporated in all Corps projects.

The Energy Independence and Security Act of 2007 requirements are being phased into projects as implementing guidance is provided by the Department of Energy. The requirement for 30 percent of domestic hot water to be solar-heated is in place.

The EPAAct 05 requirement for 30 percent better than ASHRAE has been aided by a collaborative approach between the Corps' Engineer Research and Development Center, Construction Engineering Research Laboratory; Headquarters; and the centers of standardization for respec-

tive building types; as well as the U.S. Department of Energy's National Renewable Energy Laboratory and the ad hoc ASHRAE Military Technology Group. They have developed proscriptive design guides for numerous standard Army facilities to identify a means of meeting the 30-percent-better requirement for each facility in each climatic zone.

These facilities include barracks, trainee barracks, administrative buildings such as battalion headquarters and company operation facilities, maintenance facilities, dining facilities, child development centers and Army Reserve centers.

USACE labs have conducted workshops for net-zero installations to assist the Army in meeting its goals. ERDC-CERL performed building envelope leakage tests on existing facilities to gain understanding of leakiness of Army buildings for the development of air-tightness criteria and performance requirements in design and construction strategies. Our districts have been active partners in development and execution of a solar plant at Fort Irwin, Calif. We are managing the Army's Energy Savings Performance Contracts, Utility Energy Service Contracts, Enhanced Use Leases, the Metering Program, executing the Energy Conservation

Investment Program, and participating in the Department of Defense Critical Infrastructure Program among other energy- and utility-related programs.

These are challenging and interesting times for those attempting to eliminate or diminish our dependence on foreign oil and fossil fuels. To address those challenges, we are juggling new renewable energy technologies, such as solar, wind, geothermal, fuel cells and biomass; employing energy and water conservation practices; securing energy sources; finding the right financial tools; implementing sustainable design principles; and re-educating ourselves to change our energy consumption habits for the well being of the Army. At the same time, we are adapting to and planning for the current and new federal statutes, executive orders, regulations and guidance to come in the near and distant future.

AESIS structures the desire of the Army to conserve energy and water resources and safeguard these resources to sustain our Soldiers during peace and war, during serenity and disaster conditions.

James C. Dalton, PE, is the chief, Engineering and Construction Community of Practice, Headquarters, USACE.



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established the Senior Energy Council, which is co-chaired by the ASA-I&E and the vice chief of staff of the Army. The Senior Energy Council provides guidance for the development of Army power and energy priorities and implementation plans, as well as synchronization of energy program resource requirements.

Improvements in energy security can occur in two broad ways — strengthening energy supply or optimizing demand. Supply side solutions involve looking at power production and delivery to use renewable and alternative energy sources like solar, wind, biomass and geothermal or by employing “smart grid” technologies for better power distribution. A smart grid is an electricity distribution network that delivers electricity from suppliers to consumers using digital technology to save energy, reduce cost and increase reliability and transparency. Demand side changes refer to reducing energy consumption at fixed and temporary installations, for mobility fuel use and in weapon system training and operations.



Solar arrays like this one at Fort Carson, Colo., reduce dependence on fossil fuels. Photo courtesy of ASA-I&E

Army plans for installation energy security include increased use of renewable electric power in response to possible loss of commercial grid delivery, and electric and hybrid powered nontactical vehicles to reduce dependence on fossil fuels. Yet, barriers to many improvements must be overcome.

Equipping every installation with its own power-generating capability, like a natural gas or a renewable energy power plant, may be desirable but the costs are often prohibitive. Also, community, state and federal restrictions can limit which kinds of projects can be done at a particular site.

The Army will look to partner with industry to develop large scale renewable energy production capability. This means identifying developers and the right locations for projects that will benefit both the Army and the investors.

To stimulate private sector participation, projects must be large enough to produce revenues from both supplying an installation and possibly from providing excess power to the commercial grid. Smaller scale Army energy projects of this type include the solar facilities at Fort Sam Houston, Texas, and Fort Carson, Colo. Development of a 500-megawatt solar plant at Fort Irwin, Calif., and a 30-mega-

watt geothermal plant at Hawthorne Army Depot, Nev., are currently being pursued.

Reducing energy demand involves identifying mission-critical power consumption on an installation and taking measures to use it more efficiently or cut overall energy needs. Of the many measures possible, examples include installing building insulation, energy-efficient windows, efficient lamps and controls, and high-efficiency heating and cooling equipment.

These types of improvements are also necessary to comply with the Energy Independence and Security Act of 2007 that requires all new and remodeled facilities to be off fossil fuels by 2030. Additional legislation mandates a decrease in consumption of 3 percent a year for a period of 10 years. The Army aims to have achieved a reduction of about 30 percent by 2015.

To support these and other mandates, the Army is investing heavily in upgrades and maintenance to facilities. From just the American Recovery and Reinvestment Act alone, \$375 million is being spent on such energy projects at active Army installations.

Nontactical vehicles at installations are also a target for enhanced energy security by replacing gasoline-fueled transportation. The Army will soon be one of the largest fleet operators of both low-speed elec- ➤

Army Energy Security


Army energy security means assured access to adequate and reliable energy resources that meet mission requirements on a sustainable basis. Energy security has five key components —

Surety – Preventing loss of access to required power and fuel sources

Survivability – Ensuring resilience in energy systems to overcome loss of access

Supply – Accessing alternative and renewable energy sources

Sufficiency – Providing adequate power for critical missions when, where and in the quantities needed

Sustainability – Promoting support for the Army’s mission, its community and the environment 



Solid wastes, recycling update

by William F. Eng

A lot has been going on in the solid waste and recycling world. This article covers the highlights.

Executive Order 13423

The EO requires federal agencies to conduct environmental, transportation and energy-related activities in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient and sustainable manner.

Among other things, federal agencies must:

- require recycled-content products in agency acquisition of goods and services, and use at least 30 percent post-consumer fiber content paper;
- ensure increases in diversion of solid wastes as appropriate and maintain cost-effective waste prevention and recycling programs; and
- implement sustainable practices for pollution and waste prevention, and recycling.

The Office of the Federal Environmental Executive, the agency lead for EO 13423, issued implementing instructions March 29, 2007, which stipulate that the EO requirements must be included in any



William F. Eng
Photo by Alex Stakhiv

contracts for operation of government-owned, contractor-operated facilities, as well as applied to tenants or concessionaires. The instructions also require the Department of Defense to establish a solid waste diversion goal to be achieved by Dec. 31, 2010, or to re-affirm a previously established goal.

The EO requires that federal agencies maintain waste prevention and recycling programs in all facilities in the most cost-effective manner possible; strive to meet the national recycling goal of 35 percent established by the Environmental Protection Agency or, if already met, to strive for annual continuous improvement. Agen-

cies are to recycle to the maximum extent possible, considering cost, cost avoidance, return on investment and availability of markets.

The effect of the EO is that Army installations must have affirmative procurement, waste reduction and recycling programs that meet mandated program goals.

A pollution prevention memorandum dated Oct. 12, 2004, from the Office of the Assistant Deputy Undersecretary of Defense for Environment, Safety and Occupational Health established metrics to measure progress in pollution prevention and compliance. These metrics, known as *measures of merit*, are called "MOMs." ➤

Acronyms and Abbreviations	
C&D	construction and demolition
DPW	directorate of public works
EO	executive order
ISWM	integrated solid waste management
OACSIM	Office of the Assistant Chief of Staff for Installation Management
PBWMS	performance-based waste management services
QRP	Qualified Recycling Program
SWARWeb	Solid Waste Annual Reporting Web system

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tric vehicles and hybrid-electric vehicles. Plans are to acquire 4,000 low-speed electric vehicles over three years, and 502 hybrid vehicles were recently deployed at Army installations.

Design and operation of weapon systems can have important impacts to installation energy security. Energy for tactical vehicles supports onboard combat systems, including communications equipment and cooling systems to protect the onboard electronics. During training operations at domestic installations, many vehicles often plug in to installation electricity sources — consuming electricity supplied and paid for by the installation.

In addition to fixed installations, the

Army needs secure energy for contingency operations at forward operation bases and for mobility applications. FOBs depend on liquid-fueled generators for electricity to power equipment and cool temporary structures. Most liquid fuel for generators and combat vehicle operations is delivered by fuel convoys. Cutting fuel consumption and convoy trips through lower demand and efficiency gains will keep our forces out of harm's way and allow their redeployment to other operations.

The Army is testing tactical-scale FOB electric grids to increase electric distribution efficiency and has already deployed foam insulation for temporary structures in theatre. Foam tents have been shown to cut energy consumption by as much as 50 percent in Iraq, and current locations have

projected cost savings of \$43 million for the first year of operation.

Finally, improving energy security requires shaping Army culture. Soldiers, civilians and Families — from senior leadership down to new recruits — must take ownership of energy security and do their part to optimize energy use. Without power and energy, the Army lies silent. The Army's future ability to carry out its national defense mission depends upon its energy security posture.

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Dr. Kevin Geiss is the program director, Energy Security, Office of the ASA-I&E.



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For solid waste, the program goal was to establish a cost-effective management program that includes reduction of waste generation and increased diversion, and to optimize cost avoidance. The performance metrics collected were: per capita generation of nonhazardous solid waste excluding construction and demolition debris; diversion rate of nonhazardous solid waste excluding C&D debris; diversion rate of C&D debris; and the economic benefit of solid waste diversion

Solid waste management

The Office of the Deputy Undersecretary of Defense for Installations and Environment established two policies Feb. 1, 2008. The first consists of a nonhazardous solid waste without C&D waste diversion goal of 40 percent and a C&D waste diversion goal of 50 percent, both to be achieved by 2010. The second policy adopts a holistic approach to the nonhazardous solid waste problem called “integrated solid waste management.” ISWM allows managers to make systematic waste diversion or disposal decisions based on a refined environmental management hierarchy.

Army installations must make the most of solid waste diversion to reduce solid waste disposal and the overall cost of ISWM. Waste stream characterization and analysis, and thorough knowledge of waste diversion or disposal options and associated costs are vital necessities. Keeping informed of the recycling and scrap industries, as well as the commodity markets, is crucial.

Army regulations require installations to maintain ISWM plans. By taking a comprehensive approach to managing nonhazardous solid wastes and C&D wastes, installations should be better able to determine the most cost-effective, energy-efficient and least-polluting means of handling most, if not all, of the solid waste stream.



Recycling handbook

You may have heard rumors about a mythical book called *The Army Recycling Guide*. Actually, the rumors are true. Over the past 10 years, numerous volunteers toiled over various versions of the *Army Recycling Handbook* only to run into one snag or another, which kept the tome from seeing the light of day.

This year, a handful of even harder working subject matter experts, assisted by an administrative support contractor, finally completed the re-editing and updating of this long overdue and badly needed reference guide. Over the next few months, the final draft will be reviewed by the appropriate Army staff offices to ensure that no legal, contracting, property management or sustainability rules have been violated, and finally issued electronically.

Barring any unforeseen problems, the handbook should be available by the year end.



and recycling data reporting under one system. The goal is to have one set of consistent and comprehensive data from which performance metrics that relate to future funding requirements can be derived.

Future users at the National Guard and Reserve regional readiness centers are training to use SWARWeb.

Solid waste and recycling are facilities programs under an installation’s DPW. Army regulations and funding are aligned to support this organizational responsibility. Although there are environmental attributes to these programs, and poorly run programs may result in environmental problems or even notices of violation, solid waste and recycling are not environmental programs. To drive home this point, access and support for SWARWEB will be reconfigured from the Army Environmental Reporting Online portal and the Army Environmental Command help desk to an Office of the Assistant Chief of Staff for Installation Management server and a common help desk that supports another facilities system.

Ordinance and explosive recognition

A course was designed to train Qualified Recycling Program personnel to recognize unsafe and unauthorized material when recycling firing-range scrap. Suc- ➤

SWARWeb

The Solid Waste Annual Reporting system has been the mainstay for collecting, managing and reporting the solid waste and recycling activities of active component installations for about 10 years. Except for their largest installation-like sites, the Army National Guard and Army Reserves have been meeting their solid waste and recycling reporting obligations through other means.

Last year was the beginning of a multi-phase-in period to bring all solid waste



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successful completion of this training is one of the requirements for an Army QRP to sell firing range scrap without going through the Defense Reutilization and Marketing Service. The primary audience consists of installation Recycling Program managers and QRP managers where the program includes the recycling of expended small arms brass and gleanings from fire range clearance.

The 12-hour course is offered by the Huntsville Learning Center, Ala., on a cost-reimbursable basis. The limited number of potential trainees has led to less frequent scheduling and higher per-student tuition. To counteract these factors yet recognize the vital need this training fulfills, the OACSIM funded the development of a web-based version that was beta-tested this spring to rave reviews.

OACSIM is working to locate the appropriate educational setting and to establish administrative controls for registration, tracking progress, administration of quizzes and final exams. The web-based course could be launched in early 2010. The classroom version will remain as an alternative, at least for now.

Performance-based services

OACSIM is sponsoring a pilot study of performance-based contracting for ISWM services. Three Installation Management Command installations, two from Army Materiel Command, and one each from U.S. Army Medical Command and Army National Guard will receive this special assistance for about one year. If the results are positive, the pilot installations will be able to continue this service using their own funds.

A nationally recognized, environmental consulting firm will evaluate, design, build and operate on-site waste handling technologies. The consultant will help with large and difficult-to-manage waste streams using a vast network of transportation and disposal outlets, and partnering with companies that provide cutting edge and innovative technologies. The consul-

tant will treat these materials as an asset, rather than as a liability.

The services include waste audits, training and education, and analysis and studies.

Waste audits

The consultant will use the waste audit — which provides a comprehensive understanding of waste characterization, and waste and recycling processes and practices at an installation — as its cornerstone to build an overall plan to improve waste and recycling management and processes. A waste audit captures each facility's unique variables including, but not limited to, personnel, size, volume, facility age, geographic location, demographics and vendor availability. The audit will also identify plans to meet each facility's specific requirements. Recommendations issued in a waste audit report begin the process of developing unique plans for the facility

Reporting and recommendations — After data analysis is complete, the consultant team will develop specific recommendations for waste reduction protocols and best management practices. This two-pronged approach supports targeted strategy development for clients to implement best practices or identify operational efficiencies and drive culture change, the key to long-term success.

The consultant measures success directly by the reduction in waste costs and increases in recycling, and indirectly by increased operational efficiencies and decreased soft costs, such as the space, time and labor necessary to handle waste and recycling. Instead of paying a fixed price for the waste audit report, the installation pays a combination of a lower fixed price coupled with a percentage of the savings generated as a result of the waste audit.

Performance-based waste management services — PBWMS give pricing flexibility with reduced upfront costs combined with incentives in which the consultant shares in any reduction in waste costs. PBWMS works by developing a baseline cost, the client's average cost for waste and recycling services over the previous 12 months. A 12-month period is used so that seasonal

or annual peaks and valleys can be averaged into the baseline number, which is set for the term of the agreement. If successful in reducing the costs from the baseline, the consultant receives a percentage of the amount reduced.

Upfront costs — The installation's upfront costs are based on the number, sizes and locations of the buildings, and number of employees in the buildings. Costs for any waste and recycling equipment the installation chooses to acquire is the responsibility of the Army, although the consultant is able to offer financing options.

Risk — If the consultant does not reduce the baseline costs, the installation owes the consultant nothing. The only risk for the Army is upfront costs.

Summary

The future for the Army's Solid Waste and Recycling Programs is full of challenges, opportunities and even excitement. It cannot just be buried and forgotten — it's a resource!

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Is the time coming for gray water reuse?

by Richard Scholze

Graywater or greywater or gray water or grey water! No matter how it is spelled, *gray water* is defined as the effluent from laundry and bathing use in residential facilities. It does not include water from dishwashers and other kitchen wastewater or toilets and urinals, which are collectively called *black water*.

Another term to be aware of is *reclaimed water*, which is wastewater treated to high standards at municipal treatment facilities and then delivered to customers via a “purple pipe” system, common in water-short areas such as Texas, California, Arizona and Florida.

Water resources for the nation and military installations have been receiving increasing attention due to both quantity and quality concerns. Water scarcity is expected to increase in coming years both nationally and globally. Ninety percent of water consumed on installations is for nonpotable uses and does not have to be of the highest quality. In addition, a number of legislative and executive drivers are impacting water use on installations. Gray water is one tool available to installations for reusing the existing water supply to get maximum benefit.

Gray water use has a long history in arid parts of the United States and is still common in rural areas. The quantities of gray water available are estimated at up to 40 gallons per day per person.

Current Army policy allows, where life-cycle cost-effective, reclaimed or treated recycled water to be used for irrigation and other nonpotable uses such as toilet flushing. However, gray water or untreated effluent from laundry, dishwashing and personal hygiene or bathing use will not be recycled or reused as part of a strategy to earn Leadership in Energy and Environmental Design credit without approval from the Installation Management Command.

The advantages of using gray water are several. It saves water, because less potable water is consumed. There is less discharge, i.e., a reduction of sewage gen-

erated, which often costs more to treat than potable water. Less energy and fewer chemicals are used by the water provider. Nutrients such as nitrogen and phosphorous essential for plant growth are recovered, and the hydraulic load to existing sewer systems is reduced.

Disadvantages of using gray water also exist. It may be more costly, and then the potential user must decide whether water quantity or price is of greater concern. It may decrease flow to the sewage plant, which could be a problem in some areas that have a requirement to deliver a certain amount of return flow to existing streams or where water may be reclaimed and used for irrigation or other uses. There is a small potential for spreading disease through human contact if gray water is not properly handled or treated, and a potential for odors in surge or storage tanks if it is not handled properly or it is stored too long.

There may be controversy and reluctance in some areas to use gray water. The reason is a perceived potential health threat. However, there have been no cases reported to the Centers for Disease Control related to gray water use.

For military applications, the best time to design for gray water use is during new construction. The first step is to estimate gray water production. If the building is an office, it will probably not be cost-effective to incorporate. However, if the building is a barracks, it may very well pay to incorporate gray water use.

Life-cycle cost-effectiveness should be addressed as well as whether any water restrictions exist or are being anticipated. Then, the end use is determined — whether the water will be used for toilet flushing or irrigation. That decision impacts system design. Separate systems are best installed



Technologies to capture, filter and reuse gray water are commercially available, such as this unit that catches water from lavatory use and recycles it for toilet flushing. Photo courtesy of WaterSaver Technologies


in the new construction stage.

Commercial applications around the United States and the world that may be available to the Army in the future and are at larger scale include more complex operations. Larger quantities of used water will be collected, and city blocks and large buildings will have dual plumbing and communal systems with treatment. In addition, gray water will be combined with other sources such as rainwater.

The U.S. Army Engineer Research and Development Center is preparing a Public Works Technical Bulletin that will describe the pros and cons of gray water use, a brief review of legal and health considerations, lessons learned from gray water applications in other arenas and appropriate scenarios for use for toilet flushing, landscape irrigation or other acceptable functions.

This PWTB will enable installations to determine the potential for gray water recycling or application at their facilities as part of a sustainable water program or as a supplemental water supply source. The bulletin is expected to be available early in fiscal year 2010.

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Acronyms and Abbreviations	
ERDC	Engineer Research and Development Center
PWTB	Public Works Technical Bulletin



You are the switch

by Miles D. Smith

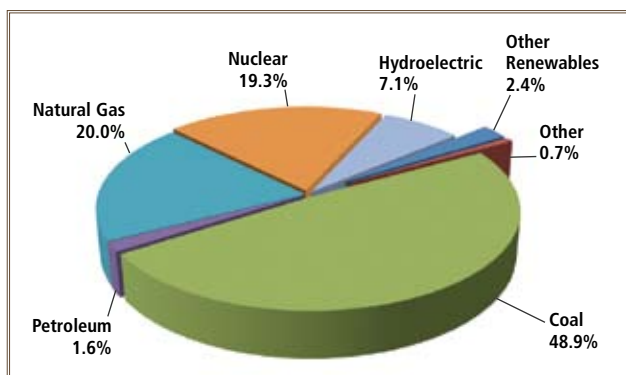
Much is said about saving energy, and many voices utter the words, "Somebody should do something." Many people believe that energy reduction is a top-down effort — the government, the military, the utilities, the garrison energy manager should each "do something."

Most view their personal energy use as negligible in the scheme of things, because it is difficult to define and quantify the resources that are used to provide convenient forms of energy. Practically speaking, utility electricity cannot be stored; it must be generated exactly when it is required. Logically then, each time you flip on a switch, you are commanding the electrical generation industry to provide you with the power you have requested, and, silently and reliably, it obliges. Unfortunately, most switches do not turn themselves off.

Turning that switch off does not require a smart grid, elaborate control system, government contract or executive order — it requires only you. **You** are the switch that turns off the switch.

To confirm that you can have a significant impact, review this short list of energy-wasting habits:

- leaving the light on when you leave a room;
- leaving the television on when nobody is watching;
- using an electric space heater under your desk.



Average U.S. electricity sources, according to the Department of Energy. Graphic by Miles D. Smith

Calculations of the cost and resources associated with each seemingly minor energy use illustrate the point.

Leaving the light on

A typical bedroom or kitchen fixture with three 60-watt incandescent bulbs left on for 10 hours per day, five days per week would occur if you left the lights on in just one room when you went to work. That is 60 watts times three, which equals 180 watts, multiplied by 10 hours, totaling 1,800 watt-hours per day. Dividing by 1,000 converts to kilowatt hours, yielding 1.8 kwh per day. Multiplied by five days gives the weekly sum of 9 kwh, and then multiplied by 52 weeks equals 468 kwh per year.

Replacing the 60-watt incandescent lamps with 23-watt compact fluorescent lamps reduces the annual waste to 179 kwh. But that positive action does not completely solve the problem of wasted electricity.

To most of us, 468 kwh is just a number — about \$47 for a typical residential rate schedule at 10 cents per kwh. But the electricity had to be generated and transmitted to the light fixture. How much fuel does it take to generate and transmit that energy?

The raw material quantities — fuels and hydroelectric water passing through a turbine — required to supply 468 kwh can be calculated. It's a fact that when a fuel, such as coal, natural gas or oil, is burned to produce electricity, about two-thirds of the heat extracted from the fuel becomes waste heat that is rejected at the power station. Just as an automobile engine releases more energy in the form of heat than forward motion, only a third of power station fuel is actually converted into electricity. To make matters worse, another 6 percent is lost between the generating station and your

fixture due to inefficiencies associated with transmission and distribution. Those factors are included in the calculation.

So, you may be surprised at how much fuel it takes to leave that light burning. These results are not either/or figures; it requires the *sum total* of these to unnecessarily leave that bedroom or kitchen light on over the course of a year:

Coal	188	pounds
Natural gas	979	cubic feet
Petroleum	0.53	gallons
Uranium	0.39	grams
Water (hydroelectric)	117.5	gallons
Renewables and other (remainder)	3.1%	

Leaving the TV on

The range of television wattages is wide, typically 120 watts to well over 400 watts. Using a middle-range, 42-inch plasma TV at 270 watts left on an extra six hours per day, you will waste 590 kwh per year and the following resources:

Coal	237	pounds
Natural gas	1,234	cubic feet
Petroleum	0.67	gallons
Uranium	0.49	grams
Water (hydroelectric)	148.0	gallons
renewable and other (remainder)	3.1%	

Using an electric space heater

Without a doubt, the ubiquitous electric space heater is an energy hog. Most draw 1,500 watts. Worse, they are often used in air conditioned spaces where each watt of heat released by the space heater must then be removed from the building by the air conditioning system.

Not including the additional air conditioning load, a 1,500-watt space heater operated eight hours per day, five days per week uses 3,120 kwh per year, and the annual resources consumed are:



How to get to net-zero energy installations

by Bill Stein

A net-zero energy installation produces as much energy on an annual basis as it consumes. To help installations achieve that goal, the Office of the Assistant Chief of Staff for Installation Management commissioned Pacific Northwest National Laboratory to come up with and test drive a plan at Fort Carson, Colo. That pilot is due to be completed by the end of September.

The requirements are that the plan:

- is developed with installation personnel;
- guides investments and develops tracking protocols with a specific integrated project list, specific timelines that identify long lead-time acquisitions and financing options;
- lays out a time-phased energy path to net-zero energy use;
- provides continuous scanning for new design ideas and new technologies; and
- optimizes the configuration of existing and new building efficiency resources, metering and controls, renewable energy resources and energy storage.

Fort Carson set a goal of full energy sustainability, or net-zero, by 2027. Why 18 years to make that target? Simply put, it takes large amounts of time and money to make fundamental changes to buildings and utilities systems. As a rule of thumb, to achieve net-zero, you need to reduce energy density by about 80 percent and provide the energy that is still needed by a



This recently constructed net-zero building is in use at Fort Irwin, Calif. Photo by Hossam Kassab

renewable or other locally available energy source.

While a net-zero energy installation supports energy security, it does not guarantee it. Even with an imported fuel or energy source, you can still make net-zero, but it will contribute much less to energy security and sustainability.

That said, getting that 80 percent energy density reduction may not be as hard as it first appears.

Lighting

Most office lighting is designed in new buildings at 0.7 watts per square foot, or 30 percent better than the American Society of Heating, Refrigerating and Air Conditioning Engineers' standard. Most existing

office buildings have lighting energy densities of 1.5 watts per square foot. Spectrally enhanced lighting pushes that to 0.35 watts per square foot.

A project at Fort Huachuca, Ariz., retrofitted existing T-8 fixtures — two-lamp, 4,100 K color-corrected-temperature in open parabolic lensed fixtures — to one-lamp, 6,500 K color-corrected-temperature, back reflector and prismatic lens that met the 0.35 watts per square foot lighting requirements of the task and greatly reduced eye strain. While the standard light meter, which reads on the Photopic scale, showed a reading of 23 foot-candles, the Scotopic scale showed 45 foot-candles, which is what the eye truly sees.

The 22 buildings retrofitted at Fort Huachuca testify that this change works well. For more information with formulas, go to <http://www.lightenergysource.com/ScotopicTechnical.htm>.

Thermal envelope

Another way to greatly reduce load is to install an air barrier. Tightening up the thermal envelop can reduce your heating and cooling energy by 60 to 80 percent. Some say this solution is too expensive, but there are cost-effective air barrier products.

Liquid ceramic insulations can add insulation value and provide a missing air

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Coal	1,253	pounds
Natural Gas	6,527	cubic feet
Petroleum	3.56	gallons
Uranium	2.59	grams
Water (hydroelectric)	783.2	gallons
renewable and other (remainder)	3.1%	

The cumulative effect of these habits depletes natural resources, degrades the environment and necessitates the

construction of ever larger infrastructure to produce and deliver the energy we demand. Now that you understand the magnitude of personal actions and inactions, will you decide to make a difference? Will you be the switch?

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Getting started with renewable energy

by Bill Stein

Renewable energy is virtually any type of energy that is not a fossil or nuclear fuel. It is considered endless, or *renewable*.

Renewable energy can be used in its pure form or by conversion to another form of energy. A pure type of renewable energy absorbs heat from the sun, maintains it in the form of heat and circulates it in a building by fans and ducts. A conversion type, like a wind turbine, takes the solar-driven kinetic energy of the wind and converts it into electricity.

Pure types of renewable energy are solar thermal, biomass thermal, daylighting, geothermal and biogas thermal. Solar domestic hot water heaters, transpired air solar systems, wood chip boilers, wood stoves, commercial daylighting systems, architectural daylighting designs, low temperature geothermal direct heating (below 180 F) and boilers run from landfill gas or wastewater



A solar electric system converts the sun's energy to electricity. Photo courtesy of Bill Stein

digester gas (methane) are examples.

Conversion types of renewable energy are solar electric systems, solar thermal electric systems, wind, hydropower, biomass electric, biogas electric and geothermal electric. Also included are ocean thermal

to electric and wave energy, but those are more applicable to Navy, Marine Corps and Coast Guard bases. Examples of conversion types are photovoltaic systems, dish/Stirling solar thermal electric generators, parabolic trough solar thermal

Acronyms and Abbreviations

PV	photovoltaic
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barrier to a roof or wall structure. Articles like this one cannot endorse specific products, but researching “liquid ceramic insulation” on the Internet will get you the names of such products.

Another type of insulation is a radiation barrier, which reduces solar load on an attic or other space. These products, which come in foils and spray-on coatings, can reduce air conditioning load by 8 to 15 percent and even reduce heating energy use. Typically, the spray is more cost effective in retrofit applications, but it depends on the labor rates for new construction. Again, researching “radiant barriers” on the Internet will help you find the products best suited for your applications.

Heat exchanger

Use an air-to-air heat exchanger to recover energy from exhaust air and help temper the required fresh air for buildings.

These exchangers can recover up to 85 percent of the energy of exhaust air. Some units add indirect evaporative cooling to reduce energy use further. Look up “energy recovery ventilators” on the Internet to get brand names.

Heat exchangers should be mandatory for every new building and retrofit. They allow heating and cooling systems to be downsized.

In most of the country, you can also use ground-source heat pumps. Combined with tightening up the thermal envelop, the heating and cooling load is greatly reduced, and you no longer need to dig extensive trenches for ground loops. You can use the existing trenching around the foundation for utilities. Samples can be seen at the Zero Energy Building Research Alliance web site, <http://www.zebralliance.com/>.

Renewable energy

With an ultra-low energy use building on post, you can supply its relatively small energy needs with on-site renewable energy. Examples are solar hot water, solar air heating panels, solar desiccant cooling, biomass wood chip boilers, waste-to-energy, wind energy and biogas from wastewater plants and landfills.

The technology is relatively easy; it is the alternative financing contracts that are the challenge. Many of the alternative financing contracts do not lend themselves to long enough terms for all renewable energy source projects.

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electric generators, wind turbines, low head hydropower electric generators, gasified biomass used in a natural gas-type electric generators, landfill gas used to run a combustion turbine electric generator and geothermal energy (steam or hot water) used to drive an organic Rankin cycle turbine electric generator.

To get started with a renewable energy project, look at three things: first, the current cost for conventional energy — electric and thermal; second, the available sources of renewable energy; and third, the economics of using the various types of renewable energy sources.

The mythical Fort Contention can demonstrate the process. The situation is tough there, because energy prices are lower than the Army average.

The average rate, factoring in both energy and demand, is 5 cents per kilowatt-hour and only \$7.50 per million British thermal unit for natural gas. Research into the weather data and potential resources of the surrounding area shows a good wind resource, a fair solar resource, a closed landfill on the fort, a nearby landfill, an on-post wastewater treatment plant and some biomass from nearby commercial operations and forest thinning for fire control.

Economic analysis yields the information that, on a 20-year life-cycle cost basis, the installation can produce electricity from wind at 6 cents per kwh, from PV for 28 cents per kwh, from landfill gas or wastewater digester gas at 5.5 cents per kwh and from biomass at 6.5 cents per kwh.

On the thermal side, the same 20-year analysis yields production costs of \$6.50 per million Btu for solar hot water, \$4.75 per million Btu for solar air heating, \$12 per million Btu for solar cooling, \$5.50 per million Btu for a biomass boiler and \$4.75 per million Btu for a biogas boiler. Daylighting with a controller would replace electricity at an equivalent rate of 4 cents per kwh.

Diving deeper into the economics, a state Renewable Portfolio Standard comes into play with incentives of 15 cents per kwh for PV systems, 1 cent per kwh for wind, 1 cent per kwh for biomass to electric and a rebate of \$10 per square foot of solar hot water panel and \$5 per square foot of solar air panel. Federal tax incentives equivalent to 10 cents per kwh for PV, 1.5 cents per kwh for wind, 2 cents per kwh for electricity displaced by a daylighting system and \$2,000 per solar hot water system are also available.

What does Fort Contention's energy staff do with all this information and analysis? Put projects together, gather support from commanders and staff, and start increasing the use of renewable energy. That is obviously easier said than done, and there is real work ahead.

At Fort Contention, the mantra is, "We've never done it that way," and people resist the change. In addition, the fort has five threatened and endangers species of plants and animals, nine native-American tribes that must be consulted and has been hit with environmental lawsuits every three years or so in the past.

The garrison commander has been there for only three months, and the senior mission commander for just six weeks. On the positive side, the leadership recognizes the need to meet renewable energy goals, move toward net-zero energy installations, provide energy security, become an energy sustainable installation and reduce greenhouse gas emissions.

The energy staff members draw upon their experience and that of others who have gone before. An action team is formed to pull together renewable energy projects and contracts.

At Fort Contention, the team is headed by the garrison deputy commander. The team includes representatives from Contracting, the Staff Judge Advocate, Resource Management, Public Works, the Environmental Office, the Archeology


Branch, Range Control and all the major missions. Some of the renewable technologies may affect radar, visual missions or even maneuver missions, so the airfield officer and the technical head of the radar testers are invited. A public affairs specialist publicizes the progress of the group to help gain public support.

The team comes up with an action plan to implement renewable energy projects. It gets direct funding for some smaller projects, like solar hot water for the gymnasium and a biomass wood chip boiler at one of the central heating plants. It works with the post's master planners to put an Energy Conservation Investment Program project together for a 1 megawatt PV system at a cost of \$6.5 million. It also uses an existing Energy Savings Performance Contract for a 1 megawatt wind turbine at \$3 million out of a total task order of \$15 million.

The team also follows the model at Fort Carson, Colo., which used a Power Purchase Agreement with a simple lease for a landfill gas cogeneration system, both electrical and thermal, and another Power Purchase Agreement for a 30 megawatt wind farm on the boundary of the North Range.

Following the three-step process of establishing current costs, researching sources and doing economic analyses has resulted in renewable energy projects that best meet the needs and resources of Fort Contention.

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Natural gas – Stop paying more for less

by Jordan Spore

Since 2003, Installation Management Command has successfully reduced its total natural gas consumption while spending on natural gas has increased. Despite this trend of paying more for less product, today's natural gas market should allow IMCOM to take fiscal year 2010 spending on natural gas back to the level of FY 2003.

Decreasing consumption is an IMCOM success story. According to the Army Energy and Water Reporting System, IMCOM installations have reduced annual consumption of natural gas by 4.6 trillion British thermal units. This reduction of energy consumption is consistent with recent energy policy measures for federal agencies, such as the Energy Policy Act of 2005 and Energy Independence and Security Act of 2007.

The steady increase in the cost of natural gas is a significant influence of the paying-more-for-less trend. Between 2003 and 2008, the year-ahead average price of natural gas increased from under \$5 per million Btu to over \$9 per million Btu — an increase of 80 percent.

Extraordinary conditions drove two price shocks in energy prices since 2003. Production and distribution infrastructure were destroyed in the Gulf of Mexico by hurricanes Katrina and Rita in 2005. In 2008, the steady rise in crude oil prices influenced a similar rally in natural gas until early July; the influence of perceptions, interpretations and forecasts for natural gas prices folded as market fundamentals didn't support the run-up.

Today, natural gas prices are very favorable for large end-users like Army installations. Month-ahead — October at this point — prices are currently trading under \$3 per million Btu. The last year in which natural gas prices for October were under \$3 per million Btu was 2001.

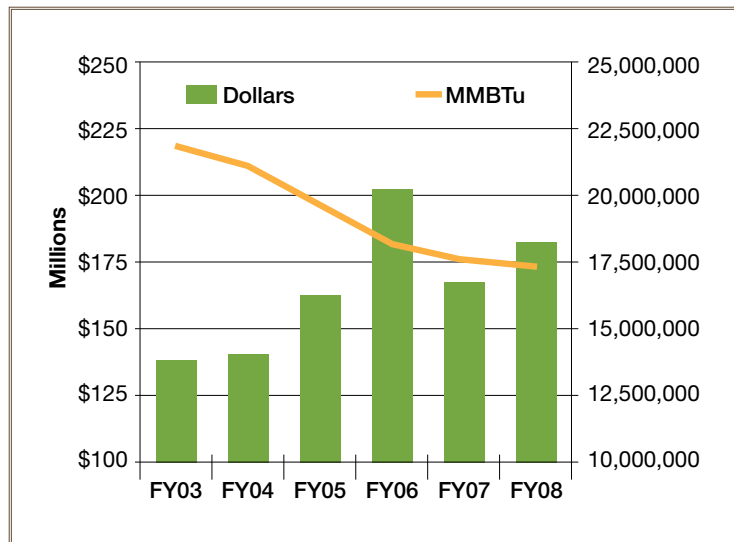
Long-term prices are also trading at multi-year lows of \$4.80 per million Btu, an average price for the year ahead in terms of monthly contracts. IMCOM's best annual average unit cost on natural gas plus transportation since 2003 is \$6.34 per million Btu.

Securing natural gas prices for future months is a way to reduce risk and exposure to future price shocks. Reserving a percentage of future demand means that an installation's final cost per month is insulated from price shocks caused by natural disasters.

One criticism of futures lock-ins points to how locking futures prices decreases the opportunity to participate in a downward trend. For example, an installation that secures 15 percent of its future natural gas demand at a price today has 85 percent of its future demand for natural gas unsettled. If prices were to crash to \$1 per million Btu, then the 15 percent lock-in skews the installation's average unit cost high.

Reducing risk through participating in the futures market requires careful consideration of the market and an installation's budget. Hesitating to secure future prices today makes sense if forecasts and market signals suggest a potential for prices to decline precipitously. Conversely, acting to secure portions of future demand makes sense when price increases are likely to increase with time.

The strongest market indicator of continued decline in natural gas prices is the imbalance of supply against demand.



This chart shows the year-ahead average natural gas price between 2003 and 2008. Graphic by Army Energy and Water Reporting Service

The Energy Information Administration announces quantities of domestic storage on a weekly basis. On an equivalent basis from year to year, natural gas in storage today exceeded previous five-year maximum levels for 13 weeks from May 1.

The surplus to previous storage highs comes even as the number of active drilling rigs declined from 1,606 in September 2008 to 677 in July. Horizontal drilling in shale formations is producing more gas per rig, somewhat offsetting the decline in active rigs.

Potential legislation on carbon emissions or climate, an economic recovery and severe hurricanes are the strongest market variables supporting increases in natural gas prices. New legislation that impacts carbon emissions is likely to inspire increased demand for low-carbon fuel like natural gas, while depressing demand for high carbon fuel like coal. Signs of economic recovery are emerging. Sustained recovery and an end to economic decline would increase demand for natural gas, and increased consumption of natural gas may take supplies from record highs to historically average levels. Finally, hurricanes in the Gulf of Mexico have demonstrated ►

Acronyms and Abbreviations	
FY	fiscal year
IMCOM	Installation Management Command



Beyond water conservation

by William F. Eng

When all is said and done, Army installations have only two options: use less water and find alternative sources and supplies.

Water conservation methods and techniques are effective. They include high-efficiency lavatory faucets for barracks, housing areas, lodging, office buildings and food service; lower-flow showerheads for barracks and fitness centers; ultra-low flush toilets for housing, barracks, administration buildings and public areas; low- or no-flush urinals; front-loading clothes washers for barracks, lodging and recreation facilities; commercial dishwashers for dining halls and food service facilities; air-cooled commercial ice machines; pre-rinse sprays for central kitchens; and Energy Star-qualified commercial steam cookers.

But, water conservation alone is not enough. As the competition for water intensifies and supplies become limited and overtaxed, water requirements will have to be met by a combination of nontraditional and new sources.

For installations to meet mandated water consumption reduction targets, while at the same time sustaining the military mission and a quality of life for the residents and employees, it will take more than conservation. To borrow a slogan from the integrated solid waste management play-book, we must reduce, reuse and recycle. We must get beyond water conservation.



William F. Eng
Photo by Alex Stakhiv

System audits, leak detection, repairs

Every gallon saved through leak detection and repair is one more gallon that can be used and one fewer gallon we have to make up for through conservation measures and new sources. At one time, system losses of 10 to 15 percent were acceptable. Losses of this magnitude would never be tolerated in the profit-and-loss business world and should not be acceptable to Army water managers.

Through the use of meters and sub-meters, distribution system audits, manual acoustical surveys and advanced technology combined remote sensing and data logging equipment, installation water managers can detect, find and repair many water leaks.

Desalination

Desalination is expensive, but when it is the only source of water for hundreds of miles, there are few options. Extensive programs are underway on seawater and

brackish groundwater. Competing desalination technologies are also making advances, and the amount of energy required to produce a given amount of product water is dropping.

In the United States, seawater is primarily processed by membranes with reverse osmosis, electro dialysis and nanofiltration. Thermal processes are also used, mostly in the Middle East because this process uses extremely large amounts of energy and there is an abundance of oil. About 40 percent of global capacity is multi-stage flash distillation.

Rainwater harvesting

Rather than channel rainwater off rooftops and pipe it by drainage ditch to a retention pond, this technology captures it, treats it on site and recirculates the water to flush toilets and irrigate lawns and landscaping.

Collection of rainfall is a beneficial use, and this technology is most applicable where other sources are expensive or not available. The usual process is rooftop capture and cistern storage. Then, the water is pumped for indoor or outdoor applications, including potable uses, toilet flushing and irrigation. The collection potential is 600 gallons per inch of rain per 1,000 square feet of surface.

Reuse, recycle

Limited water resources must be better used before they are discharged to the environment. Using water and literally throwing it away after one use is inefficient and wasteful.

One of the Federal Emergency Management Program best management practices involves single-pass cooling equipment, which provides an opportunity for significant water savings. In these systems, water is circulated once through a piece of equipment and is then disposed down the drain. Equipment that typically use single-pass cooling includes CT scanners, degreasers, hydraulic equipment, condensers, air compressors, welding ➤

Acronyms and Abbreviations

CERL	Construction Engineering Research Laboratory
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the potential to disrupt significant natural gas supply infrastructure and stir market prices upwards.

At IMCOM Headquarters, natural gas experts are studying what moves the market using technical analysis of trending, news from energy companies, supply and demand metrics, analysis of energy policy, and weather patterns of temperatures and

hurricanes. These experts are prepared to support the development of a natural gas strategy or to discuss current events in energy markets.

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machines, vacuum pumps, ice machines, X-ray equipment and air conditioners.

To remove the same heat load, a single-pass system uses 40 times more water than a cooling tower operated at five cycles of concentration. To maximize water savings, single-pass cooling equipment should be either modified to recirculate water or, if possible, should be eliminated altogether.

The reuse opportunities are practically limitless. The water can be used for irrigation of parade fields, golf courses, gardens, cemeteries and landscaping. It has industrial applications for cooling, boilers and construction. It can be used for groundwater recharge and control of saltwater intrusion and soil subsidence, as well as recreational and environmental use in lakes and ponds, and for marsh and stream flow augmentation.

The water can also be employed for nonpotable urban uses, such as firefighting, air conditioning and toilet flushing. Vehicle wash racks are another opportunity. They can be properly designed and operated to capture, treat and reuse the water to clean even the most mud-caked tracked vehicles.

Gray water

The Army is not yet advocating that installations recycle or reclaim sanitary wastewater, or black water, for immediate use on installations, but society is becoming more receptive to the reuse of gray water, the wastewater from bathroom and kitchen sinks, showers and laundries, except from washing baby diapers. Installations may soon follow that lead.

It has been postulated that 90 percent of water needs in a highly developed, technically savvy society do not require potable water. Gray water can be used — sometimes with minimal treatment — for irrigation and toilet flushing.

There are two basic system types:

- direct diversion
- collection, treatment, storage and distribution

Direct diversion is suitable for subsurface irrigation and toilet flushing. The collection, treatment, storage and distribution type of system can be used for gardens, toilet flushing and, potentially, laundry washing.

Installations must check with their state plumbing codes for acceptability of gray water use. States generally follow either the Uniform Plumbing Code or the International Building Code.

Water sustainability study

Water demands are outstripping water availability in many regions of the United States. Military installations' water needs now have to compete with the water needs of the agriculture sector, small and large industries, and nonfederal governmental entities. Large regions of the United States are experiencing historic water shortages due to population growth, contamination, drought, electrical energy production, bio-fuels industry development, elimination of wetlands and stressed aquifers.

Under the auspices of the Army secretariat, the Army Environmental Policy Institute sponsored water sustainability studies conducted by the U.S. Army Corps of Engineers' Construction Engineering Research Laboratory at 10 sites — eight within Installation Management Command, one in Army Materiel Command and one Army National Guard.

The studies' objectives are to develop strategic plans for each location to meet military installation mission and quality-of-life water needs over a 25-year horizon




in a sustainable way, while also meeting Executive Order 13423 water consumption intensity reduction goals. The results of these installation-specific studies will be applied to other installations Armywide.

Summary

Water is an essential resource, vital to maintaining quality of life and supporting mission. Demand for water is greatly increasing, and current practices and supplies are insufficient for the future. Installations must use less or find new sources or supplies. In this effort, installations are not alone; water reuse and efficiency are mandatory for the nation. New and emerging technologies should be demonstrated and adopted, and water quality should be matched with needs.

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Army energy, water awards presented

by Valerie D. Hines

The winners of this year's *Secretary of the Army Energy and Water Management Awards* were recognized by Craig College, the deputy assistant chief of staff for installation management, during a ceremony Aug. 12 at the Department of Defense All-Hands Energy Meeting in Providence, R.I., after the GovEnergy Conference.

The awards program was established in 1979. Installations, small groups and individuals from the Army, Army Reserve and Army National Guard are eligible for consideration.

Each awardee received an engraved plaque, a certificate and a monetary award. The winners are:

Installation Award

- *Energy Efficiency/Energy Management* – **Fort Sill, Okla.** – Andrew F. Bennett, John Rutledge and Gary Holt
Cost avoidance: \$2,225,000
Energy saved: 134,211 million British thermal units

Small Group Awards

- *Renewable/Alternatives* – **Fort Knox, Ky.** – Pat Appelman, Paul Frye and Steve Fries
Cost avoidance: \$266,000
Energy saved: 21,380 million Btu

- *Renewable/Alternatives* – **New Jersey Army National Guard** – John Hasting, Thomas Comyack, James Lally and William Mangan
Cost avoidance: \$50,000
Energy saved: 1,130 million Btu

- *Energy Efficiency/Energy Management* – **Aberdeen Proving Ground, Md.** – Anh Dang, Jeff Presgraves and Daniela Caughron
Cost avoidance: \$2,400,000
Energy saved: 156,177 million Btu

- *Water Conservation* – **Tooele Army Depot, Utah** – Richard Anderson, Russell Smalling, Victor Hammond, Jon Hayden and Joshua Jones
Cost avoidance: \$4,500
Water saved: 5 million gallons

Individual Awards

- *Energy Efficiency/Energy Management* – **Thomas Struble**, Picatinny Arsenal, N.J.
Cost avoidance: \$1,495,455
Energy saved: 175,795 million Btu
Water saved: 21.94 million gallons
- *Water Conservation* – **Walter Unick**, Picatinny Arsenal
Cost avoidance: \$125,000
Water saved: 31.7 million gallons
- *Energy Efficiency/Energy Management* – **Daniel Wood**, Fort Eustis, Va.

Cost avoidance: \$2,800,000
Energy saved: 1,324 million Btu

- *Energy Efficiency/Energy Management* – **Mohammed Ikram**, Detroit Arsenal, Mich.


Cost avoidance: \$505,000
Energy saved: 30,672 million Btu

- *Energy Efficiency/Energy Management* – **Dieter Haertel**, U.S. Army Garrison Kaiserslautern, Germany

Cost avoidance: \$500,000
Energy saved: 42,000 million Btu
Water saved: 5 million gallons

These 10 awards recognize installations and individuals who made significant achievements in energy and water conservation. Their efforts resulted in the Army saving more than 562,000 million Btu of energy and 64 million gallons of water with a cost avoidance exceeding \$10 million. These totals represent almost one-third of the Army's total energy reduction for fiscal year 2008.

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The 31st annual energy and water awards honorees pose after the August ceremony in Providence, R.I. Photo by Terry Shoemaker



Partnering with your utility: energy services contracts

by Randall Smidt

Installations today face ever increasing energy goals and limited resources to meet those goals. How do you find the necessary funds to design and build the projects needed to meet your annual 3 percent energy reduction goal?

One option is alternative financing. If your installation has a good, long-term working relationship with your serving utility, you may be able to use that rapport to help meet your energy goals with alternative financing through a Utility Energy Services Contract.

Utilities partner with the Army in many ways, including providing the utility commodity, privatization, energy security, demand response, metering and UESCs. If your utility offers UESCs, the utility can provide the financing of the capital costs, design and installation of energy- and water-saving projects and renewable energy projects. The utility's investment is then paid back through the cost savings achieved by the project over up to a 10-year contract period.

The Army first used a UESC in 1992 at Fort Lewis, Wash. Since then, 241 UESC task orders have been awarded at more than 30 installations with more than \$327 million invested for annual savings of more than \$40 million. UESC use has increased recently with an average of about \$35 million invested annually over the last five years.

More utilities are becoming interested in partnering with their customers in this manner, and the Edison Electric Institute has encouraged its member utilities to provide \$2 billion in private investment funding by 2010 for life-cycle, cost-effective federal facility improvement projects. Currently, at least six Army installations have UESC projects under development.



Randall Smidt
Photo by Josephine Smidt

With increased interest in UESCs, the Army is focusing on the program. A study is underway on *Improving Army Installation Collaboration with Utilities*. OACSIM is developing a methodology for retention of rebates, incentives, savings and proceeds from the sale of renewable energy. Most importantly, OACSIM will soon release a new UESC policy guidance handbook similar to the Energy Savings Performance Contract handbook released in December.

The UESC handbook addresses organizations and responsibilities involved with UESC projects, how to start a UESC, contracting methods available, measurement and verification, project execution, resource requirements, reporting requirements and other considerations. It also presents examples of UESC projects at installations.

If you are considering a UESC, start by asking your utility if it offers UESC, or check the listing of participating utilities on the Federal Energy Management Program web site at http://www1.eere.energy.gov/femp/financing/uescs_utilitypartners.html. If your utility doesn't offer UESC services but is interested in doing so, facilitation to help the installation and utility get started is available from FEMP or from Pacific Northwest National Laboratory.

If you have only one serving utility that offers UESC, you may sole-source. If you have more than one serving utility that offers UESC, you must give fair notice and consideration to all the utilities and compete the work if more than one is interested.

A fuel-neutral approach should be used. The offering utility should address measures for all energy sources and water, regardless of the commodity sold by the utility. It may also offer resource efficiency manager services.

When you have determined if you can do a UESC at your installation, begin forming your project team. The team should include upper management decision makers, the director of Public Works, an energy manager, engineers, a contracting officer, procurement personnel, a legal representative and the utilities manager, as well as representatives from the Environmental Office, the building operations and maintenance staff, all affected tenants, Security, Information Technology, Master Planning and your utility partner. The team should address educating everyone involved in the process, documenting progress, setting goals, determining needs and potential conflicts from all perspectives, and selecting contract type.

Contracting methods that may be available include a General Services Administration Areawide Contract, a Basic Ordering Agreement, an agency master agreement or model agreement, or a site-specific contract. The GSA Areawide Contract and the Basic Ordering Agreement are the most frequently used methods for UESCs on Army installations. More detailed information on these methods and some sample documents are available on the FEMP web site at http://www1.eere.energy.gov/femp/financing/uescs_types.html.

Since UESC is not a guaranteed savings performance contract, no measurement and verification is required by law, however, the Army requires cost-effective M&V to be used to determine if calculated project savings are realized. Baseline and performance goals must be identified in an M&V plan, as well as how post implementation energy consumption will be measured. Proper maintenance, operation and savings must be verified at least annually.

The UESC manual gives a how-to ➤

Acronyms and Abbreviations	
FEMP	Federal Emergency Management Program
M&V	measurement and verification
OACSIM	Office of the Assistant Chief of Staff for Installation Management
UESC	Utility Energy Service Contract



Utility assessment surveys help installations manage utility costs

by Robert Hennessee

The U.S. Army Engineering and Support Center, Huntsville, Ala., performs site utilities assessment surveys to help installation Directorates of Public Works ensure the manner by which they purchase and sell utilities services is aligned with applicable regulations and best commercial business practices. These surveys also help installations determine if they are getting the best value for their money.



Robert Hennessee
Photo by Becky Proaps

Situation

Utilities costs have greatly increased. Installation DPWs have been hit with deregulation, privatization and shared energy performance contracts simultaneously. As a result, attention to the sale and resale of utilities was diverted. In addition, electricity rate caps expired in several states triggering much higher rates. Cash-strapped states and municipalities are attempting to increase their revenues by adding fees and taxes to utility bills. If that's not enough, rates for fuels are more volatile than ever.

Perhaps the worst of these developments is the volatility of electricity, fuel oil and natural gas costs. Until fairly recently, a post's utility costs could be accurately forecast by increasing its prior year costs by a

cost-of-living adjustment of 2 to 5 percent for each following year. That's changed. During the 2000-2001 California electricity crisis and its fallout, an entire year's electricity budget was often spent in one month. Simultaneously, natural gas costs tripled creating the same effect.

The next year, many increased their budgets based on 2001 costs only to see rates fall sharply due to increased production and storage, and an economic slump following Sept. 11. In the years since, prices haven't returned to normal. Budgeting for utilities has become a guessing game.


Focus of surveys

The site visits focus on two key questions:

- Are utilities being purchased in the most advantageous manner for the installation?
- Are all reimbursable customers being billed accurately and fairly?

installation meet its energy goals even if you don't have the budget to do the projects on your own. The handbook should be available in December.

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To Request a utilities assessment


The U.S. Army Engineering and Support Center, Huntsville, can arrange a two-day visit to your installation to meet with your energy managers, assess how your program is working, make recommendations and assist in their implementation. For information, call Stan Lee at 256-895-1504, or DSN 760.

Utility invoices will be checked for errors and inapplicable charges such as taxes. The usage profile will be examined to determine whether the supplier offers the best rate and that the correct rate is used. Unfortunately, little can be done to prevent the volatility of energy prices, but it's possible to tell if you're getting the best rates available. Reimbursables rates charged to the various categories will be examined as well as the methods for calculating usage.

Benefits

- The benefits of having a good utility purchase and resale program are:
- getting the best rates available;
 - stabilizing cash flow from resale customers by ensuring they are billed fairly using accurate consumption and rates;
 - demonstrating that the DPW is acting as an honest broker; and
 - streamlining the billing process, which improves cash flow, because utility charges and how they are calculated are transparent to customers, they will pay more quickly and budget accordingly, making them partners rather than adversaries.

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Acronyms and Abbreviations

DPW	Directorate of Public Works
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on project execution from start to finish — the audit request and project initiation, kick-off meeting, the audit, feasibility study, engineering and design, approval, construction and installation, and project completion and acceptance phases. Resource requirements for funding, staffing, project financing and payments are also covered.

This handbook will open possibilities to partner with your utility to help your



Metering program helps Army installations reduce energy costs

by Debra Valine

Sometimes saving energy is as simple as installing a meter.

In the past, the Army did not have meters on buildings to measure electricity or natural gas use; the installation received one big energy bill that was not broken down by individual buildings. That situation started to change with the Energy Policy Act of 2005 that requires metering in federal buildings by Oct. 1, 2012.

Energy-use studies have shown that, by metering individual buildings, installations are able to identify which buildings are the biggest energy hogs and take appropriate measures to reduce energy consumption.

The Army Metering Program is installing advanced meters that report remotely to a central data base accessible via the Engineering Knowledge Online web site. This system will provide Army installations the capability to measure and track electricity, water, natural gas and steam consumption at the facility level. It is one way the Army is working to meet energy reduction goals. The Army also requires the installation of advanced utility meters on all Military Construction projects and for renovation or energy projects with a programmed cost of \$250,000 or more that include electrical, natural gas, water or steam components.

The U.S. Army Engineering and Support Center, Huntsville, Ala., is responsible for managing the execution of the metering and other energy programs for the Office of the Assistant Chief of Staff for Installation Management and the Installation Management Command.

Installation of electric advanced meters began in fiscal year 2008 on facilities that were deemed cost effective to meter based upon Office of the Secretary of Defense



These advanced meters capture the electric use and natural gas consumption for the Redstone Arsenal (Ala.) Post Exchange and report the data to the energy manager in the Directorate of Public Works. Photo by Patrick Holmes, Johnson Controls Huntsville

criteria, which says that buildings that consume an estimated \$35,000 per year in electrical costs are economically justified for metering. For Army planning and budgeting purposes, the \$35,000 per year electrical cost equates to buildings of 29,000 square feet and larger.

“This translates to approximately 6,700 Army, Army Reserve and Army National Guard facilities to be metered at more than 480 sites worldwide,” said Lawson (Stan) Lee, chief of the Facility Support Division, Huntsville Center. “Electricity, natural gas, water and steam or high temperature water will all be metered. To determine the exact number of meters required, all installations are currently being surveyed in phases. The anticipated scope is a total of 13,000 advanced meters.”

By the end of FY 2009, the Army had installed advanced electric meters on 47 percent of its facilities that were economically justified for metering, according to David Purcell, Army Energy Program manager for OACSIM’s Facilities and Policy Division. This amounts to 3,151 out of 6,700 required by the end of FY 2012.

Last December, Huntsville Center awarded the contract for the Meter Data Management System that will receive meter readings from across the Army.

“Once implemented and certified noteworthy, Directorate of Public Works energy managers and anyone else with Army Knowledge Online access will be able to select among an extensive menu of number-crunching reports using almost real-time meter data for any and all metered facilities of interest,” Lee said. “Time of use, peak power demand, trending, comparisons of the energy consumption per square foot for similar facilities, correlation of meter readings with local weather data ... the potential analytical applications are huge.”

Pilot testing is scheduled at three installations: Fort Carson, Colo., Fort Lee, Va., and Fort Stewart, Ga., by October, followed by Armywide implementation, phased in accordance with the status of meter installation.

“Information from the pilot sites is being compiled so that a road map can be developed and implemented to demon- ➤

Acronyms and Abbreviations	
FY	fiscal year
MDMS	Meter Data Management System
MILCON	Military Construction
OACSIM	Office of the Assistant Chief of Staff for Installation Management



GovEnergy spotlights advances in technology

by Cecile Holloway

During the August GovEnergy conference, sessions on technology advances that could enhance the overall energy performance of federal facilities were provided. The sessions covered software and hardware innovations in building management and control systems, increased efficiency and applications of combined heat and power, cost effective technologies in special applications, new lighting innovations, quantum technologies and advanced roofing and insulation techniques.

For lighting, the focus is on **light-emitting diode**, or LED, the most discussed option available in the lighting industry today. Although it has been around for quite awhile, LED lighting has only recently begun to find its place in the outdoor market. Spectral enhanced lighting, induction lighting and natural light harvesting were presented as recent lighting innovations.

The lighting industry has changed dramatically over the past few years, making it critical to select the correct luminaire to meet the user's needs. The color of the light, cost, maintenance and even the environment play a part in determining the type of source you choose.



Advances in roofing design and construction have made significant contributions toward **sustainable roof solutions**. Sustainable roof solutions include white or reflective cool roofs, recycled-material roofs, photovoltaic roof systems and green or vegetative roofs. They tend to extend the roof's life, improve its thermal efficiency and minimize the burden on the environment. The proper type and amount of roofing insulation can be one of the greatest factors in determining the energy efficiency of any roofing system. More complex sustainable roofing involves the use of vegetative or garden roofing systems that integrate storm-water management systems and increase energy efficiency.

A **wireless batteryless solution** featured during a presentation is also known as energy harvesting technology. Wireless batteryless devices are powered by different kinds of ambient energy, such as light and vibration. This technology allows wireless communication between wireless batteryless sensors, switches and controllers for an open building automation system.

The technology offers several benefits in building automation through cost reduction since the devices do not require wiring installation, do eliminate wire conduits, do not cause disturbance to tenants during replacement or retrofits, do eliminate batteries and are maintenance free. This technology is truly a green building solution.

Check out these new technologies. They may benefit your future construction, renovation and retrofit projects.

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strate the MDMS proof of concept from smart meter readings," said Jefferey Murrell, metering program manager, Huntsville Center.

The Army is ahead of schedule for its metering requirements, Purcell said. In FY 2008, \$19.6 million was spent on advanced meters, and \$2.8 million on the MDMS. As of July, \$14.5 million had been spent on meters and \$3.2 million on MDMS for FY 2009.

OACSIM expects about \$20-25 million per year for FYs 2010-12 to complete the majority of the electric metering and a large percentage of the natural gas meter-

ing, Purcell said. He also anticipates about \$5-7 million per year for FYs 2010-12 for MDMS, followed by \$1-2 million per year for operation and maintenance of the MDMS.

The estimated number of buildings determined to be cost effective to meter for natural gas is 2,200 based on experience, from which it was learned that 33 percent of buildings requiring electric meters also required natural gas meters. To date, 727 advanced natural gas meters have been installed, which equates to 33 percent completion and is ahead of schedule for the required gas metering completion date of Sept. 30, 2016. Costs for steam and water meter installation will be

programmed in the FYs 2012-17 Program Objective Memorandum.

"When the Army Metering Implementation Plan is completed, advanced electric meters will be metering more than 50 percent of total electrical consumption," Purcell said. "This coverage will increase due to the meters being installed on MILCON and repair [and] renovation projects."

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Geothermal development with Energy Conservation Investment Program

by Ron Diehl

The Army has embraced ground-source heat pumps and geothermal energy as high priority efforts to help meet energy reduction goals and ensure energy security to support the Army mission. GSHP technology uses constant ground temperatures to provide infinite heat sinks to augment heating and cooling. Geothermal, on the other hand, uses high-temperature water found at considerable depths to provide direct heating and electric generation.

In recent years, the Army has used the Energy Conservation Investment Program to accomplish both types of projects, although GSHP projects can be accomplished in a much shorter time than geothermal development. Also, more areas of the country lend themselves to GSHPs, while true geothermal resources are found in the western United States in the area known as the Pacific Rim. Development of a geothermal power plant takes from three to five years to complete.

GSHP projects are not defined as *renewable* since they don't actually generate energy. However, the broad application of these project results in considerable reduction in postwide energy density and greatly assists installations in meeting energy reduction goals. Four GSHP projects at Fort Knox, Ky., provide support for almost 20 barracks buildings and resulted in the elimination of several boiler and heating plants.

In fiscal year 2005, the Army committed to using ECIP funds for two geothermal test wells at Hawthorne Army Depot, Nev., to confirm the presence of a geothermal resource that could form the basis of a

commercial power plant. The advantages of geothermal power include the elimination of fossil fuel consumption, 24/7 operation and use of a resource provided by the Earth's old volcanic activity.

The Army wages a constant battle against increasing utility costs caused by higher demand and an increased Army mission. The only direct-funded program to help the Army improve energy efficiency and install renewable energy is ECIP, which is funded by the Office of the Secretary of Defense with Military Construction funds.

Congress appropriates funds for this program for projects that improve the energy efficiency of existing buildings and utility systems and install renewable energy systems. The net effect is to reduce consumption of fossil fuels and replace existing systems with renewable systems to eliminate petroleum use.

ECIP projects are generated by installations using DD Form 1391, the standard form to describe the scope, impact and cost of MILCON projects. Because the ECIP project documentation is simpler than that for regular projects, a track in the Programming Administration and Execution processor has been created to facilitate ECIP projects. In addition, a life-cycle cost analysis is done for each project to determine if it would be cost-effective and save energy in excess of its original cost. The more a project saves, the more likely it is to be approved and funded. In the ECIP Track, this life-cycle cost analysis form is at Tab D and automatically uploads the discount factors based on the project's economic life and geographic location.



The New Jersey National Guard's photovoltaic system, built with ECIP funds at Sea Girt, N.J., produces 230 kilowatts of electricity. Photo courtesy of New Jersey National Guard

Examples of typical ECIP projects include computer energy monitoring systems; energy-efficient lighting systems; gray water systems, which reuse drain water and rainwater to reduce water demand; wind turbines; photovoltaic cells; solar walls; solar water heating; and geothermal systems.

In FY 2009, OSD received \$80 million in ECIP funds, of which the Army received \$23.5 million for 16 projects. The FY 2009 stimulus program provided the Army with an extra \$32.4 million for an additional 16 projects. In FY 2010, OSD expects to receive \$90 million, although the Senate Armed Services Committee has proposed a substantial increase in this amount.

Typical problems with ECIP project execution include cost overruns based on market conditions and world demand; delays in obtaining equipment, i.e., wind turbines; and competition for engineering resources by the MILCON and Base Realignment and Closure programs. It is extremely important that projects are carefully scoped and described in a detailed way so the design agent is able to create an accurate design package. In addition, it is the responsibility of each installation to provide a way to measure and verify actual energy savings for each ECIP project. ➤

Acronyms and Abbreviations	
ECIP	Energy Conservation Investment Program
FY	fiscal year
GSHP	ground-source heat pumps
MILCON	Military Construction
OSD	Office of the Secretary of Defense



Army Energy and Water Reporting System update

by Cecile Holloway

The web-based Army Energy and Water Reporting System, called AEWRS, will be enhanced to provide an energy progress report card for each installation at all levels within Installation Management Command, the Army Reserves, the National Guard, Army Medical Command, Surface Deployment and Distribution Command, Space and Missile Defense Command and the Army Materiel Command. The progress report will be a tool for managing energy use and progress against the baseline, evaluating energy trends and determining progress toward reduction goals.

The unit of tracking energy reduction will be in million British thermal units per 1,000 square feet. Water will be tracked in gallons per square feet. The graphical presentations will show reduction goals with energy consumption against its 2003 baseline and water consumption against its 2007 baseline.

The mandated goals are 3 percent per year relative to 2003 energy consumption intensity and 2 percent per year relative to 2007 water consumption intensity. Consumption intensity is a unit of measure per thousand square feet. It is imperative that square footage is reported correctly to the Real Property Inventory database, because AEWRS captures this information to calculate consumption intensity of energy and water.

AEWRS does not offer the tools to provide the graphical trend of an installation's progress toward energy and water

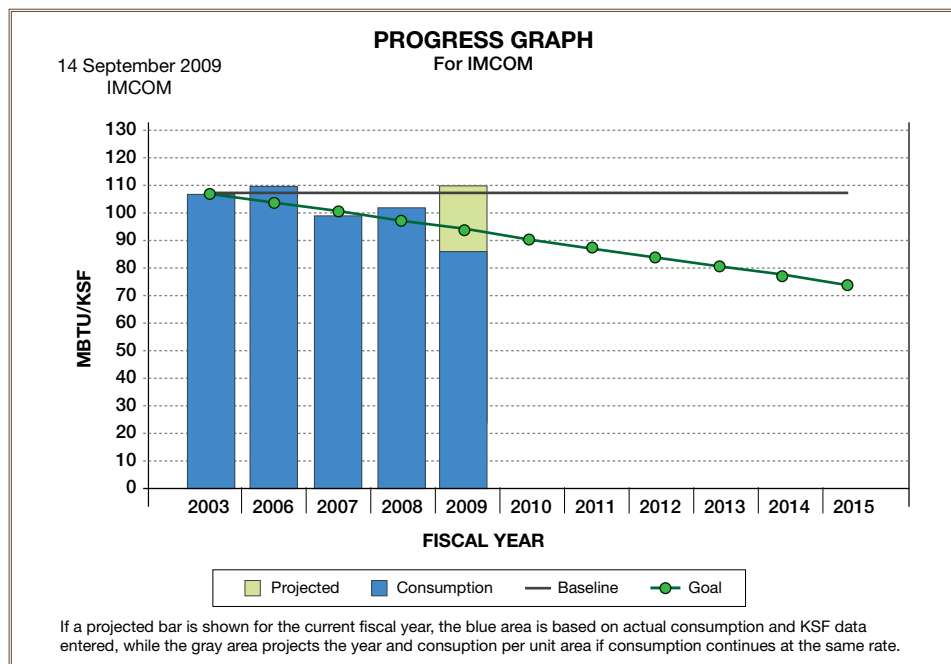
Acronyms and Abbreviations

AEWRS Army Energy and Water Reporting System

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In the near future, the savings results for ECIP projects will be entered into the AEWRS database to meet Department of Energy reporting requirements.

The current FY 2010 ECIP program is being revised based on project insertions for the FY 2009 stimulus program.



reduction goals. The percentage of change must be manually calculated to show the reduction against baseline. Discrepancies in unit conversion and square footage have been corrected.

The system improvements will benefit the installations and staff action officers in several ways:

- Information can be used by staff action officers to prepare information papers with supporting factual data.
- Access to information for Office of the Assistant Chief of Staff for Installation Management staff, installation managers and energy managers is provided in real time.
- Data integrity is maintained, because information is developed from energy

managers and installation managers who are familiar with ongoing energy projects.

- Data from all sources is entered one time by the energy managers and accessible to everyone, savings man-hours.
- A cross-check between energy and water reports is implicit, making it easier to more quickly capture and correct erroneous data.
- System improvements provide reliable and consistent units of measures in energy and water reporting.
- Because the reports are web site accessible, the energy and water reports enhance awareness of the installations' energy managers.

Watch for the *Army Energy and Water Management Progress Report*. Information will be available at the AEWRS web site, <http://aewrs.hqda.pentagon.mil>.

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Gas-engine-driven heat pump shows promise for energy efficiency

by Chang W. Sohn and Jose Esparza

The U.S. Army Engineer Research and Development Center is evaluating a new technology called *gas-engine-driven heat pump* for its potential to improve space heating and cooling efficiency at military facilities. Performance data analyzed over two years' testing suggest that GHPs outperform conventional space heating and cooling systems.

Sustainable use of limited energy resources dictates higher energy efficiency in space heating and cooling applications. A GHP system offers an energy-efficient alternative to cooling and heating using either a conventional electric air-conditioner and gas furnace combination or an electric heat pump. GHP is a vapor compression heat pump system powered by a customized natural or propane gas-fired engine. In a GHP, the gas engine is employed to drive a compressor for the heat pump system.

GHP is a distributed energy system that also provides an excellent energy conservation opportunity by on-site use of the waste heat for space heating. Distributed generation with a micro-grid system is an emerging trend to reduce the loads on over-capacity transmission lines as well as allowing use of alternative energy sources.

ERDC's Construction Engineering Research Laboratory installed and monitored the field performance of the GHP test version for a year, from May 2007 to April 2008, at six Department of Defense installations in the southwestern United States. A summary of cooling performance for the six units during 2007's cooling season, June 1 to Oct. 1, showed an average coefficient of performance of 1.23. A COP

of 1.23 means that one unit of energy from natural gas delivered 1.23 units of cooling.

In comparison, the COP for the electrical heat pump, 1.09, shows that 1.09 units of cooling is delivered at the expense of one unit of energy from natural gas. This field measurement shows that GHP heat pumps delivered 13 percent more cooling than the electrical heat pump using the same amount of natural gas for electrical generation.

The favorable primary source energy efficiency of GHP technology can be attributed to the absence of the 9 percent transmission and distribution loss, and variable speed operation of the compressor following the load variation. Thermodynamically speaking, the vapor compression refrigeration cycle employed in the GHP unit is the same as the one used in the electric heat pump. The capability of varying energy input, i.e., lower engine speed for reduced cooling load, however, would improve the COP compared to a fixed energy input for a compressor at a fixed speed.

The heating performance data for the six units during 2008's heating season, Dec. 1, 2007, to April 1, showed an average COP of 1.4. The energy efficiency of natural gas furnaces is measured by annual fuel utilization efficiency. The higher the AFUE value, the more efficient the model.

Although most makers list their furnaces as "high efficiency," the Department of Energy sometimes refers to units with an AFUE higher than 90 percent as "high efficiency" and lower-AFUE models as "mid-efficiency." By this measure, the GHP system is 56 percent more energy efficient for heating than conventional



A 10-ton GHP is in operation at Luke Air Force Base, Ariz. Photo courtesy of ERDC

high-efficiency (90 percent) gas furnace heating systems.

Documentation of field energy performance in space heating and cooling is available in a technical report, ERDC/CERL TR-09-1, *Gas-Engine-Driven Heat Pump Demonstration at DoD Installations*, on the Internet at <https://www.ccer.army.mil/td/tips/pub/details.cfm?pubid=8050>. Based on the findings from the beta-version field testing, the GHP system has been fine-tuned for commercial production.

A one-year field demonstration of the precommercial units at five DoD installations started March 1. Concurrently, the commercial-ready version is undergoing ETL Testing Laboratories certification. Within a year or two, the GHP unit is expected to be available in the commercial market as an off-the-shelf heat pump system for energy-efficient space heating and cooling.

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Acronyms and Abbreviations	
AFUE	annual fuel utilization efficiency
CERL	Construction Engineering Research Laboratory
COP	coefficient of performance
DoD	Department of Defense
ERDC	Engineer Research and Development Center
GHP	gas-engine-driven heat pump



Template will help installations tackle energy issues

by Valerie Hines

Energy security means ensuring the Army is capable of performing its mission regardless of failures of the commercial power grid or interruptions of fuel supplies. The Army's future plans for power and fuel at home, overseas and on the battlefield must account for such challenges. The solutions require expanded use of alternative fuel, renewable sources, reduced consumption, increased efficiency and achieving net-zero — producing as much energy as is consumed — at critical installations.

The *Army's Energy Security Implementation Strategy* is a comprehensive plan to reduce energy consumption, increase efficiency and promote energy security. This strategy was approved by the Army Senior Energy Council Jan. 13. The plan covers garrisons, tactical and nontactical vehicles, weapon systems, contingency area bases, and research and development of improved energy capability and new investment options.

The AESIS addresses the energy security challenge through established central leadership and strategic energy security goals:

- ESG 1 – Reduced energy consumption
- ESG 2 – Increased energy efficiency across platforms and facilities
- ESG 3 – Increased use of renewable and alternative energy
- ESG 4 – Assured access to sufficient energy supplies
- ESG 5 – Reduced adverse impacts on the environment

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



After the AESIS was approved, the *Army Energy Security Implementation Plan* was created. The AESIP consists of objectives and metrics to support and implement the goals of AESIS.

AESIP's objective 4.1a under ESG 4 requires Headquarters, Department of the Army to provide an Army-level template for energy security plans. The Office of Assistant Chief of Staff for Installation Management contracted with the Department of Energy's Pacific Northwest National Laboratory to develop the template to be included as a section to every installation's security plan. The template is an initial step toward addressing energy security issues and helping build stronger security plans for installations.

The template:

- provides a consistent framework to address energy security issues;
- develops a checklist of items to review and inspect that would rank a site's current utility and energy security posture;
- develops a checklist of items to identify actions or projects needed to improve or harden a site's utility and energy security posture;
- establishes procedures to follow during a threat of, or loss of, utility and energy resources; and
- develops a remedial action plan to mitigate unacceptable risks.


This template is a guide for Army garrisons to:

- verify mission-critical tasks performed at the garrison;
- identify energy sources required to maintain missions;
- confirm existing backup power capability for each facility that supports the mission;
- evaluate contingencies in the event of an interruption in power for both short- and long-term outages;
- perform gap analysis between mission energy requirements and current energy supplies;
- develop risk mitigation strategies for interruptions in power;
- create interruption response procedures; and
- review procedures and checklists annually and revise accordingly.

Fort Sill, Okla., volunteered to be the pilot to evaluate the process and the template. Lessons learned will be used to modify the template and the process prior to using them across the Army. Fort Sill was selected based on the installation's recently completed energy security assessment conducted by the U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory and Concurrent Technologies Corporation.

To understand the potential energy-related vulnerability to Army missions and exposure of facilities to energy disruptions, Army energy managers and commanders must prepare and update annually their energy security plans.

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Acronyms and Abbreviations	
AESIP	Army Energy Security Implementation Plan
AESIS	Army Energy Security Implementation Strategy
ESG	energy security goal



Reduce your energy footprint with Energy Savings Performance Contracts

by Michael W. Gabe

The glide path toward reducing energy and water consumption set forth in the Energy Policy Act of 2005, Executive Order 13423 and the Energy Independence and Security Act of 2007 has become a significant issue in the lives of installation management and energy professionals. Many believe that the demand for energy and water consumption reduction will become stronger under the current administration.

One of the tools available to address these energy and water reduction requirements is the Energy Savings Performance Contract. An ESPC is a partnership with an energy services company and requires a long-term relationship. ESPCs have been employed by all branches of the armed forces, federal and state government agencies, and the public and private sectors. Some examples of ESPC projects include improvement or replacement of boilers, lighting, diesel generators, cooling towers and natural gas supply.

Payment for these contracts is derived directly from the energy savings they create, so the net cost to the organization or installation is minimal. ESPCs require a measurement and verification process for all installed energy conservation measures. If there are no energy savings, there is no payment required.

As of Jan. 1, the Army had successfully executed more than 115 ESPCs at more than 60 installations within and outside the continental United States with an investment value exceeding \$800 million. Projects currently in process and under development at Installation Management Command installations exceed \$300 million, and the fiscal year 2009 projection for



new ESPCs exceeds \$150 million.

Army guidance in a memo from the Office of the Undersecretary of Defense dated Jan. 24, 2008, states that, to achieve current energy conservation goals, Department of Defense installations must embrace ESPCs and Utility Energy Service Contracts. The memo further states that components should try to award ESPCs and UESCs equivalent to 10 percent of the component's annual energy expenditures, and those not achieving the 10 percent investment milestone must provide an explanation.

In December, the assistant chief of staff for installation management signed the *Policy Guidance for Implementation of an ESPC Task Order*, the long-awaited revision to the 2005 ESPC handbook. The revised handbook describes the ESPC as a tool that Army facility managers can use to solve facility problems and reduce energy consumption with minimal up-front cost.

Applied with care and consideration, ESPCs can:

- save energy and water, and reduce costs;
- help meet environmental requirements;
- reduce equipment breakdowns;
- provide better, more productive living and working conditions; and
- enhance energy security.

Also in December, the Department of Energy and the Corps of Engineers released new indefinite delivery-indefinite quantity contracts for ESPCs, increasing available funding by a factor of 10. ESPCs are also available through the General Services Administration and as stand-alone contracts. The DoE and USACE contracts provide a list of 20 energy service companies that have agreed to compete for installations' energy management business.


Start by reading the policy guidance handbook. The handbook serves as a road map for processes and procedures, and includes example documents, information on the various contracts that are available, instructions on forming the ESPC team, funding requirements, information on measurement and verification, and other aspects of an effective project.

Contact your regional energy manager and your command's ESPC subject matter experts as early as possible. These people are knowledgeable and are there to help you avoid many of the pitfalls in setting up, negotiating and implementing an ESPC.

There is also web-based training available at no charge from the Federal Emergency Management Program that covers all aspects of the ESPC process. All members of the installation ESPC team should take advantage of these sessions if only to refresh their memories.

The ESPC handbook it is available at: <http://army-energy.hqda.pentagon.mil/policies/guidance.asp>.

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Acronyms and Abbreviations	
DoE	Department of Energy
ESPC	Energy Savings Performance Contract
UESC	Utility Energy Service Contract
USACE	U.S. Army Corps of Engineers



National watershed assessment: Decision support framework for regional planning

by Elisabeth Jenicek

Planning in a watershed context is critical to sustainable operations of military installations. Planning decisions — what facilities to construct, where to construct them and what technologies to use — have an impact on dam operations. Conversely, dam operations affect flood control, availability of potable water, recreational opportunities and ecosystem functions.

The U.S. Army Engineer Research and Development Center recently completed a national watershed assessment to inform operations of U.S. Army Corps of Engineers dams. *The National Water Sustainability Analysis* provided a screening of watersheds for which additional studies, planning and actions may be recommended to ensure continued viability and sustainability of USACE dam operations.

Acronyms and Abbreviations	
CERL	Construction Engineering Research Laboratory
ERDC	Engineer Research and Development Center
HUC8	eight-digit hydrologic unit code
SIRRA	Sustainable Installations Regional Resource Assessment
USACE	U.S. Army Corps of Engineers

The project used methods developed in 2005 that apply a subset of sustainability indicators from the Sustainable Installations Regional Resource Assessment tool to the watershed scale of analysis. This methodology was updated with the latest data sets and several new indicators were added.

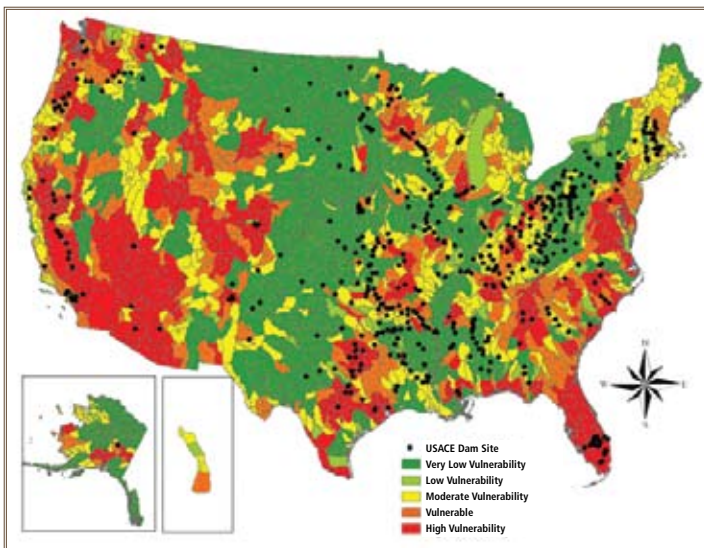
The 27 SIRRA indicators relate to water supply and demand in a watershed context. Through the use of SIRRA, this project identified watersheds with potential sustainment problems, ranked watersheds by their relative vulnerability to such problems and referred those watersheds containing critical USACE dams and flagged as “at risk” during screening to evaluation and referral for appropriate intervention.

ERDC’s Construction Engineering Research Laboratory applied this method to the 2,252 eight-digit hydrologic unit code watersheds in the continental United States. The results were displayed in national maps color-coded on a scale from very low vulnerability to high vulnerability, with point scores ranging from 1 to 5. The 607 USACE dams were overlaid on top.

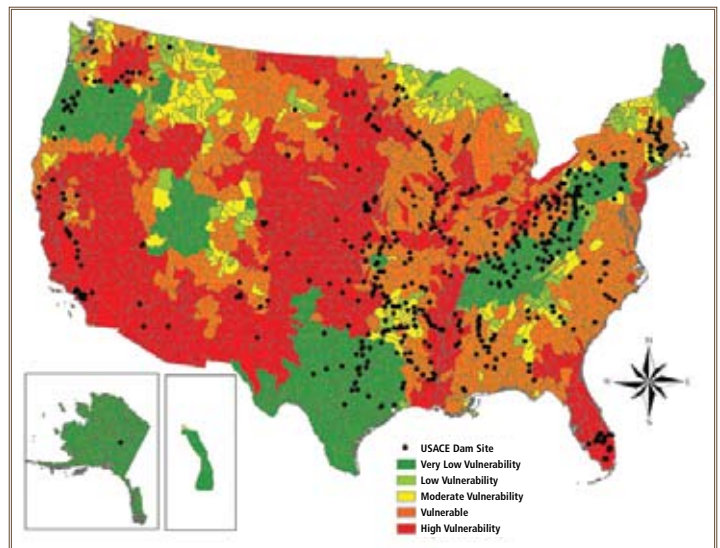
The scores for the 17 water supply indicators were summed to obtain an overall water supply vulnerability score for each watershed. The same was done for the 10 water demand indicators to obtain an overall water demand vulnerability score. The sum of all 27 indicators provided a rating of watershed health.

The selected indicators represent a broad spectrum of issues related to resource availability and development. The 27 indicators provide a wide variety of information about population, land development and use, watershed quantity and health, natural disasters, infrastructure, air pollution and regional energy.

Indicators come from a variety of sources, such as the U.S. Geological Service for water use information, the Environmental Protection Agency for air pollution data, the U.S. Fish and Wildlife Service for endangered species data and the U.S. Census Bureau for population statistics. Since most of these are national data sets and were chosen due to the availability of national data, mapping provides a ready pictorial view of the sustainability issues. ➤



This indicator is a measure of how fast a region has grown from 2000 to 2007. The degree of population growth is an indicator of the demand for water resources. Data is from the U.S. Census Bureau



This indicator characterizes the extent to which rates of groundwater withdrawals are exceeding long-term average recharge rates. Data is from the U.S. Geological Service



3 ways to use Energy Star in federal facilities

by James Symanski Jr.

Most people are aware that the Environmental Protection Agency's Energy Star program makes it easy for consumers to identify energy-efficient appliances, but many have no idea that the Energy Star program also rates buildings and homes. Since its inception, the program has expanded into many facets of our daily lives, including construction and renovation.

It is now possible to construct or retrofit entire buildings to earn the nationally recognizable Energy Star label. In fact, several components of the Energy Star program easily apply to Public Works and the entire federal facilities system.

First, organizations can sign up to take the Energy Star Challenge. The challenge is a public commitment to help improve the energy efficiency of America's commercial and industrial buildings by 10 percent or more. Commanders and managers set the tone and direction for their organizations, so there's no better way to get the team thinking about reducing energy consumption than to declare publicly, "We are committed to energy efficiency."

The **second** component of the Energy Star program that relates directly to Public

Works is the ability for buildings to qualify for the Energy Star label. To qualify, a building must score in the top 25 percent of similar buildings based on the EPA's national Energy Performance Rating System.

To take advantage of this aspect of the program, energy managers and facility managers set up a portfolio on the Energy Star web site, <http://www.energystar.gov>, and input data about their facilities. The web site will tell them how their facilities compare to similar ones throughout the nation. If a building's rating is above 75 percent, it may be eligible for Energy Star status. If the rating is below 75 percent, it's time to take action.

The **third**, and possibly most important, component of the program is the "taking action" component. Public Works professionals should relate easily to this component, because it's where the "shovel meets the dirt."

The Energy Star program offers several sources of information and suggestions for improving a facility's energy efficiency. One major resource is the EPA's *Guidelines for Energy Management*, which explains the various steps involved in improving energy usage.

Another resource is the *Energy Star Building Upgrade Manual*, which uses a methodical approach to improving energy use in a building by:



- retro-commissioning – to ensure the building is being used as intended and that equipment is working properly;
- enhancing lighting – through design, efficiency, automatic controls and maintenance;
- reducing supplemental loads – in equipment and building envelope;
- improving air distribution systems – through adjustment, modification and maintenance; and
- modifying heating and cooling – based on the new energy load.

For Public Works and energy management professionals, many great resources are available to help guide an energy conservation program. The Energy Star program can be used to either complement an existing energy-efficiency program or as the basis for a new program. One of the best ways for an organization or installation to show commitment to energy conservation is to have a building or multiple build- ➤

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A list of watersheds ranked by relative vulnerability score is the outcome of using the SIRRA methodology in a watershed context. Of the 2,252 HUC8 watersheds in the nation, the analysis indicates that 601, or 27 percent, of the watersheds are vulnerable or highly vulnerable. Another 1,011, or 45 percent, of the watersheds were rated as moderately vulnerable. The remaining 639, or 28 percent, of the watersheds were rated as having low or very low vulnerability.

Areas of high growth and urbanization host the most endangered watersheds. Regions within California, Arizona, the southeast states and the New Jersey-New York City area show the greatest vulner-

ability. This is not an unexpected result, as these areas have experienced rapid growth and continue to experience development pressures. Watersheds in areas rated the least vulnerable tend to be located in rural areas or settings with low population.

This application of the SIRRA model demonstrates a prototype for how a web-based decision support framework can be applied to systemwide watershed management. The assessment represents the first tier of a multi-tiered approach that allows use of various levels of models and tools based on scientific needs, user ability and available resources. The framework is flexible to allow individual applications of the information to support decision-making. The SIRRA framework supports USACE's desire for adaptive management

methods, learning frameworks, multi-purpose planning and sustainable solutions.

Results of the assessment were captured in *National Water Sustainability Analysis: A Characterization of U.S. Watershed Health*, a publication of the USACE Actions for Change program. The report includes the metadata documentation for each indicator and provides the logic for indicator selection along with data sources, method of calculation and assessment criteria. Expected publication is September.

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Corps lab helps Army reduce energy leakage

by Alexander Zhivov

Design guides that help Department of Defense facilities achieve at least 30 percent energy savings over a baseline built to the minimum requirements of the American Society of Heating, Refrigerating and Air Conditioning Engineers Standard 90.1-2004 have been developed for new buildings to be constructed under the Military Construction Transformation Program. The energy savings comply with the Energy Policy Act 2005 requirements.

These design guides were developed by the U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory, in collaboration with Headquarters, U.S. Army Corps of Engineers, USACE's centers of standardization, the Department of Energy's National Renewable Energy Laboratory and the ad hoc ASHRAE Military Technology Group. The design guides pertain to barracks, administrative buildings, maintenance facilities, dining facilities, child development centers and Army Reserve centers.


Results for unaccompanied enlisted barracks and tactical equipment maintenance facilities were implemented through the Army's standard design-build process in late 2007 by incorporating into the Army standard request for proposal the target energy budgets and the recommended sets of technologies by climate zone to meet these budgets.

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ings earn Energy Star status.

The Energy Star web site provides energy and facility managers, engineers, maintenance technicians and homeowners a wealth of information on improving a facility's energy usage.

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Over the past several years, building envelope leakage tests on existing facilities have expanded the understanding of the general leakiness of Army buildings. Graphic courtesy of ERDC-CERL

Based on a computer analysis using EnergyPlus 2.0, baseline and target energy budgets are clearly defined for these building types located inside and outside the continental United States in all 15 Department of Energy climate zones. A recommended set of energy-efficiency solutions for each climate zone is provided for each type of building and location that results in at least a 30 percent energy savings in addition to an improved living environment that reduces the potential for mold growth.

Among the major factors contributing to reduced energy use in all climate zones and mold prevention is air leakage through the building envelope. Over the past several years, ERDC-CERL has conducted building envelope leakage tests on existing facilities to gain understanding of the general leakiness of Army buildings and to analyze the effect of increased airtightness on building energy consumption, and to develop airtightness criteria and performance requirements to include in design and construction strategies.

Based on the results, USACE set an air leakage test requirement for all new buildings and buildings undergoing major renovation, the result of which must be less

than or equal to 0.25 cubic feet per minute per square foot of exterior envelope at 0.3 inches of water gage (75 pascals) pressure difference. The test is outlined in the protocol developed by ERDC-CERL together with industrial partners. Depending on the climate, the total building energy cost savings due to improved building air tightness can range from 5 to 25 percent.

Since introduction of this requirement, several Army buildings were constructed and tested for airtightness. Some were proven to have an air leakage rates between 0.16 and 0.25 cubic feet per minute per square foot at a pressure difference of 0.3 inches of water gage (75 pascals). Few buildings have to be sealed and re-tested to meet these requirements. This experience has shown that, when buildings are designed and constructed with attention to details, they can meet U.S. Army requirements for air tightness with only a minimal cost increase, due primarily to development of architectural details and testing.

Another way in which CERL is helping Army engineers, architects and energy managers with energy issues is through training. In 2007-2008, USACE and the Installation Management Command cosponsored four EPA Act 05 Workshops and three Mold Prevention and Energy Reduction Workshops in several locations, including overseas. The week-long workshops were attended by more than 600 participants.

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Acronyms and Abbreviations

ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
CERL	Construction Engineering Research Laboratory
EPA Act 05	Energy Policy Act of 2005
ERDC	Engineer Research and Development Center
USACE	U.S. Army Corps of Engineers



Sacramento District leads the way in renewable energy

by David Killam

One way the U.S. Army Corps of Engineers is contributing to energy conservation is the construction of renewable energy systems on military bases. In the western United States, Sacramento District is building solar, geothermal and wind projects on installations that will provide renewable energy and reduce demands to local power grids.

“Renewable energy programs are becoming an important part of our mission area,” said Bruce Handel, chief of Army and Air Force Programs, Sacramento District. “Each project is a small step in the direction of our country’s energy independence.”

One such project is a **windmill** being built at Tooele Army Depot, Utah. The windmill is 300-foot tall including the blades, will generate electricity from winds as low as 8 mph and will provide up to 50 percent of the energy demand for Tooele. Any excess energy will be sold to Rocky Mountain Power, the post’s energy supplier.

“The windmill will operate whenever the wind is blowing,” said Paul Feldman, senior project manager for the Sacramento District. “The windmill can operate in wind speeds of up to 25 mph. For safety reasons, the windmill has sensors that shut it down in winds that are higher than this speed.”

The windmill is part of the Department of Defense’s Energy Conservation Incentive Program, established to promote energy conservation and renewable energy programs. Project cost is about \$3.745 million. Annual maintenance costs are expected to be about \$25,000 to \$28,000.

“Payback in the terms of energy savings for the base will be realized in approximately 25 years,” Feldman said.

When environmental clearances have been obtained, the starting phase — pouring a concrete pad for the windmill — will begin.

“The manufacturer of the windmill provides a template, which is a device that identifies where bolts are placed onto the

pad,” said Feldman. “Once the template is attached and the bolts are placed accordingly, the frame of the windmill is fastened to the template. The rest of the windmill is bolted together, similar to assembling a bicycle.”

“This definitely meets our renewable energy goal that has been mandated for government installations,” said Jay Weyland, electrical engineer for Tooele.

The windmill is expected to be completed in the fall of 2010.

Sacramento District is also building a **solar energy heating system** at 12 Tooele warehouses. The concept is simple. Large warehouses are clad in dark metal siding set about 6 to 8 inches from the wall. Between the building and the siding, air is heated by solar radiation. As the warm air rises, it is inducted into the building through blowers. The process makes for a much more comfortable environment for maintenance workers at the warehouses and helps clean out some of the fumes generated by diesel engines maintained within them.

“For very little cost or expenditure of energy, we can help to heat warehouses during the winter at a substantial savings to the government,” said Gary Headley, project manager and architect. “These panels not only save money, but they also lessen air pollution from fuel that would ordinarily have to be burned for heat. During the summer months, we simply turn the fans off.”

This technology has already been used at Fort Drum, N.Y., and Fort Carson, Colo., according to Conserval Systems, Inc., makers of the panels.



Sacramento District is adding solar panels, similar to this shown on a Fort Drum building, to 12 buildings at Tooele Army Depot. Photo courtesy of Conserval Systems Inc.

The project, scheduled to be completed in spring 2010, will cost about \$750,000 for 12 warehouses and one community gymnasium.

In the northern Nevada desert, at Hawthorne Army Depot, Sacramento District will be tapping natural energy sources to build a **geothermal energy plant**. The Corps will be working with the U.S. Navy, which built a similar plant at China Lake Naval Weapons Station, Calif. The plant, scheduled to be completed in 2012, will produce up to 30 megawatts of energy per year.

“That’s enough energy to provide all of Hawthorne’s energy needs and sell excess to Nevada utilities,” said Steve Saepoff, chief of Military Construction Programs. “Thirty megawatts is enough electricity to power 50,000 homes.”

Geothermal energy is produced by drilling into the ground to reach hot water that is naturally occurring from hot springs or hot spots. The water is then depressurized and turned into steam, which is pumped into the plant and powers a turbine. The turbine spins and produces electricity.

The cost for drilling the holes for the project will be about \$2.5 million. Construction of the power plant will cost



Commissioning – ‘X-ray’ of heating and cooling systems

by Keith Yamanaka

Do you know if your heating, ventilating and air conditioning system is working well? On the surface, the building is comfortable; no complaints have been received; the system is new and has all the up-to-date bells and whistles — variable frequency drives on all the pumps and fans, premium efficiency motors, variable air volume, dedicated outside air treatment, carbon dioxide sensors, high-efficiency chiller and heat pumps, and a sophisticated direct digital control system.

The system must be working properly and saving energy — right?

The System Sustainability Division of U.S. Army Garrison Hawaii’s Directorate of Public Works discovered through commissioning efforts that, below the surface, there are many defects. Commissioning is a systematic process that verifies that the design meets the owner’s requirements, the equipment is installed and operated according to the construction documents and manufacturers’ instructions, devices are calibrated and equipment operates together smoothly. Like a medical X-ray, commissioning reveals things one never knew one had.

Using a commissioning contract issued by the Engineering and Support Center, Huntsville, Ala., USAG Hawaii “X-rayed” 58 buildings and about 4,310 tons of cooling and water heating systems, and discov-

ered \$1.45 million of annual energy loss. This amount is expected to grow since the effort is only 60 percent complete.

The contract covers Schofield Barracks and Wheeler Army Airfield. Buildings being commissioned include administrative buildings, operation facilities, data centers, training facilities, barracks and dining facilities.

These deficiencies were discovered during retro-commissioning:

- 196 chill water valves in a barracks left locked open after initial testing and balance;
- variable frequency drives running at 100 percent, resulting in a 40-kilowatt loss on a 250-ton system;
- all variable air volume terminal box relays left in manual full open position;
- formerly unknown fan units;
- a 263-kilowatt heat reclaim chiller (heat pump) that ran for five years;
- six air-handling unit direct digital controls’ graphic screens reading one air-handling unit;
- miscellaneous broken belts and clogged coils;
- subcooled rooms due to design defect; and
- arms room dehumidification defect by design.



During retro-commissioning at USAG Hawaii, a chiller’s controls are examined. USAG Hawaii photo

No one is perfect. Rather than appoint blame, DPW Operations and Maintenance staff, the Corps of Engineers’ Honolulu District, construction contractors, design engineers, the commissioning contractor and DPW’s Sustainability Division worked together to resolve the deficiencies and prevent reoccurrences.

Working together to resolve the problems is the true success of the effort.

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Acronyms and Abbreviations

DPW	Directorate of Public Works
HVAC	heating, ventilating and air conditioning) system
USAG	U.S. Army Garrison

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about \$20 million. It will be built through a partnership with a local utility.

“These projects are an indication of how the Corps of Engineers is implementing the Department of Defense’s commitment to renewable energy sys-

tems,” said Saepoff. “Our activities are consistent with the vision articulated by the chief of the Army Corps of Engineers for a more sustainable base for energy producing projects, and we’re proud to be a small part of our country’s energy self-sufficiency capability by building these facilities.”

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Bright ideas that save energy abound at West Point

by Martha Hinote

The U.S. Army Garrison at West Point, N.Y., home of the U.S. Military Academy, is putting its best foot forward to increase energy awareness and to save energy resources. One way is by, literally, putting feet to the pedal.

Pedal power

The Directorate of Public Works obtained five bicycles that were no longer being used for cadet training from the Department of Physical Education. The DPW refurbished them, developed operating and safety procedures and began using them for on-post transportation instead of government vehicles.

“The use of bicycles conserves energy and provides a healthful alternative for our employees,” said Matthew Talaber, director of Public Works. “This is a small, but important step in supporting the superintendent’s energy conservation initiative.”

Using a bicycle is not mandatory, and employees must provide their own safety helmets. Bicycles may not be the preferred method of transportation in bad weather or when time between meetings is short. However, they do offer a cost-effective, energy-saving alternate means of getting around West Point. An extra bonus is not having to find a parking space, which is always a challenge.

The DPW Bicycle Transportation program offers a systems approach to energy savings, a key principle in West Point’s combined academic and Army installation environment. In addition, the program also promotes employee fitness, and it gives used government equipment a second life.

The program is new and will be evaluated in terms of energy savings, effectiveness and return on investment at periodic intervals. At West Point, where physical fitness is a part of the culture, this program has potential expansion possibilities if it is effective and results in energy savings.



The West Point Youth Center gymnasium before lighting was replaced is dimly lit. Photos courtesy of West Point DPW



After energy-efficient lighting is installed, costs are reduced, and the gym is more brightly lit.

Lighting replacements

Another recent improvement that has already resulted in an estimated \$10,000 in energy savings this year is the upgrade of lighting in two buildings to energy-efficient systems. Crews from DPW’s Electric Shop exchanged the 400-watt high-intensity discharge lighting systems in the Youth Center Gymnasium and the West Point School to T5 lighting.

The transition from the less-efficient units will decrease energy consumption and electrical costs and reduce the cost of repair parts and man-hours required to replace lighting for years to come. This year’s savings include lower replacement parts costs and so were larger than what is expected next year when cost savings are based on electrical reductions alone. Next year’s savings are estimated to be about \$2,830. The transfer from high-intensity discharge lighting resulted in a 45.6 percent reduction in the cost of parts and a 52.4 percent reduction in electric consumption at the West Point School; and a 52.2 percent reduction in the cost of parts and 48.8 percent reduction in electric consumption at the youth center.

In addition, the new lights produce more equalized lighting. The lighting difference has improved the overall appearance of the gymnasium and the school rooms, greatly reducing operation safety concerns at both facilities.

“An unexpected benefit of the lighting was the increased level of performance of the youth involved in all sport activities that take place in the gymnasium,” said Brian Szeli, director of Fitness and Sports for Children, Youth and School Age Services. “Our youth have shown an increased desire to participate in our sports programming since the new lighting has been installed.”

Another advantage to the T5 lighting system is less visible now but could be of greater importance for the future. That advantage is the real-life lesson it gives the children who use the two facilities. The old lighting had a reset feature that was slow to reset, so it could not always be turned off between classes or uses. A message was given indirectly to the children that energy savings was not a commitment of the garrison or important for the future. The T5 system with its instant start-up allows the lights to be turned off between uses and reinforces a consistent energy-savings message to the children.

Energy awareness

“Through the formation of a grass-roots Energy Awareness Committee, we are striving to educate the West Point community and change the cultural awareness of our energy use,” said Geri Wildenberg, West Point facility engineer. “The committee is made up of representatives from garrison activities who take on the

Acronyms and Abbreviations

DPW	Directorate of Public Works
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Fort Hood offers alternative fuels for GSA fleet

by Christine Luciano

When Soldiers and civilians go to the pump to refuel at Fort Hood, Texas, they can now use cleaner burning fuel that emits less pollution and helps save the Army money. The alternative fuels are also a part of Fort Hood's sustainability initiative and its efforts to reduce dependency on oil.

Four years ago, Fort Hood's Directorate of Logistics and Directorate of Public Works' Environmental Division partnered on a project to establish infrastructure for Ethanol 85 and biodiesel. E85 is an alcohol-fuel mixture that typically contains up to 85 percent denatured fuel ethanol and 15 percent gasoline. Biodiesel is a mixture of low sulfur diesel and renewable oil, such as soybean or vegetable oil.

"Fort Hood fleet vehicles are required to use this alternative fuel because of mandates by Executive Order 13423 and the Energy Independence and Security Act of 2007," said Robert Kennedy, Air Program manager. "These mandates require General Services Administration to buy flex-fuel vehicles for nontactical use and to use the alternative fuel if it is available.

"Fort Hood's overall air sustainability goal is to reduce the impact on regional air quality from all sources, including mobile sources. For this area, the primary sources of pollution are our vehicles, so if we can do anything to reduce our emissions from mobile sources, that will help meet our overall goal," Kennedy said.

First, a fuel optimization evaluation was conducted on the automated fuel service

station's infrastructure. The evaluation determined the infrastructure lacked the needed equipment and distribution channels to support E85 and biodiesel, according to Sally Jo Hahn, an environmental consultant.

"To overcome this challenge, Fort Hood worked with the Defense Energy Support Center to fund and make required capital improvements to support alternative fuels," Hahn said.

The DESC manages the procurement and distribution of fuel for all branches of the armed forces.

"The DESC established the infrastructure and the associated costs to help Fort Hood expand its available fuels from JP8 [jet fuel], gasoline unleaded and ultralow sulfur diesel to also [include] E85 and biodiesel," said Brent Hemenway, installation fuels officer.



Alvin Cobbs, a transportation motor pool bus driver, fills his bus with biodiesel at the Fort Hood automated fuel service station. Photo by Christine Luciano

The automated fuel service station now includes four E85 dispensers and four biodiesel dispensers. Of the 1,320 total GSA vehicles at Fort Hood, 668 vehicles, or about 50 percent, can use alternative fuels. Each vehicle has an associated identification link key that is encoded with the customer's billing information.

"The automated billing process is very efficient," Hemenway said. "Customers insert their VIL keys at the pump to activate and start it. The VIL keys track charges on the vehicles, and the customers are billed within 48 hours through a DoD [Department of Defense] finance system."

Alternative fuels will save Fort Hood more than \$100,000 during the first year, according to Bob Bishop, director of Logistics.

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Christine Luciano is the environmental outreach coordinator, Directorate of Public Works, Fort Hood, Texas.

Acronyms and Abbreviations	
DESC	Defense Energy Support Center
E85	Ethanol 85
GSA	General Services Administration
VIL	vehicle identification link

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extra mission to devise ways to increase the awareness of their co-workers about energy use."

This grass roots committee will be just one of the many ways used to get the energy message out to the community. All of West Point's efforts are directed toward establishing it as an Army leader

in energy conservation and savings, while achieving cadet education and leadership development with the involvement of the entire West Point community.

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Martha Hinote is a customer relations representative, DPW, U.S. Army Garrison, West Point, N.Y.





Schofield constructs water reuse system

by Paul J. Schuler

Sprawling more than 17,725 acres and with a population of about 28,000, Schofield Barracks is Hawaii's largest Army installation on the island of Oahu. Schofield and nearby Wheeler Army Airfield require ample supplies of freshwater. While Oahu is lush, green and surrounded by the deep blue sea, the installations experience periodic drought that limits available freshwater supplies and water for irrigation.

To address this issue and to support the Army's sustainability initiative, the Directorate of Public Works upgraded the post's wastewater treatment plant with modern technology to expand its capacity and to produce R-1 (high-quality) recycled water.

R-1 reuse

In 2006, DPW personnel worked with Aqua Engineers, a local water and wastewater management company, to construct a Schofield Barracks Wastewater Treatment Plant reuse system. In addition, the DPW developed an R-1 reuse program that enables the Army to redirect an estimated 4.2 million gallons of water per day.

The local reuse project is being carried out under a 50-year privatization agreement with Aqua Engineers, which owns, operates and upgrades the wastewater treatment plant. Aqua Engineers is currently designing and constructing an R-1 distribution system to further recycle water for irrigation and operations such as equipment washing. The eventual objective is to reuse the entire plant flow of up to 1.5 billion gallons annually, ultimately preserving potable water that would otherwise be used for irrigation and post operations.

Membrane bioreactor technology from General Electric Water and Process Technologies was installed to accomplish reuse and distribution goals. The plant eliminates excessive concentrations of organic materials in the discharge water.

Award-winning facility

The project won the *Secretary of the Army Sustainability Team Award* and two *GE Ecomagination Awards*. *Ecomagination Awards* honor organizations engaged in finding the boldest, most innovative, successful and economic solutions to pressing environmental problems. Less than 1 percent of GE's customers have earned the honor.

"Our previous wastewater treatment plant was often cantankerous, had a limited capacity insufficient for future base expansions and couldn't provide recycled discharge water with high-enough quality for Army reuse," said Alan Goo, DPW deputy director. "Since the upgraded plant was commissioned, our sustainability readiness has improved.

"The privatization agreement has taken care of the operational issues, while the MBR system not only gives us copious quantities of clean, recycled water, it has nearly doubled the plant's capacity without increasing its physical footprint," Goo added. "The plant also can be expanded further to handle potential future growth needs."

Treating wastewater

Wastewater treatment involves three stages. First, solids are separated from the wastewater stream. Second, dissolved biological matter is progressively converted into a solid mass by using waterborne microorganisms. Third, the biological solids are neutralized and disposed of, and the water is then disinfected and discharged. If the water is clean enough, it's reused as the Schofield Barracks MBR system provides.

The post's existing, conventional-activated sludge wastewater treatment plant was retrofitted with an MBR that is modular and expandable. It combines the biological treatment of wastewater contaminants in aeration basins, with the physical separation of solids from water via hollow-fiber, ultrafiltration membranes that



The Schofield Barracks Water Treatment Plant has been retrofitted with MBR systems that separate solids from water and wastewater. Photo courtesy of U.S. Army Garrison Hawaii

are immersed in the wastewater.

The hollow-fiber membranes have a pore size about one-twentieth of the width of a human hair. Solid matter can't get through the pores and is separated from the water.

Capacity increased

Water-treatment capacity was increased from 3.2 million gallons a day to 4.2 million gallons a day. The plant now supplies some 100,000 gallons each day of premium recycled water, which is used to irrigate lawns, golf courses, parks and other sites.

Only four of the six existing aeration basins were used. When future expansion is required, the remaining two can be used to provide an additional 50-percent capacity within the existing space to a total 6.3 million gallons a day.

"Budgets are always an issue in today's military," said Goo. "The privatization approach we took with our wastewater treatment plant and the technology it

Acronyms and Abbreviations

DPW	Directorate of Public Works
MBR	membrane bioreactor



Deployable-renewable energy resource tested at Fort Irwin

by Roch Ducey, Kelly Dilks and Bruce O'Dell

For some time, the National Training Center's Operations Group at Fort Irwin, Calif., has been investigating alternatives to diesel generators, which are currently used extensively throughout the various NTC training facilities. These training ranges are far from the cantonment area and are located in the middle of inhospitable terrain, with summertime temperatures near 120 degrees.

A Fort Irwin utility provider, Southern California Edison, estimated that it would cost about \$1 million a mile for extending power distribution lines. Calculating a minimum of 60 miles, the cost for a utility-based option would be roughly \$60 million, with no long-term cost savings. Southern California's San Bernardino County, where Fort Irwin is located, has one of the highest electric utility rates in the country at well over 14 cents per kilowatt-hour.

With funding provided by the Office of the Assistant Chief of Staff for Installation Management's fiscal year 2008 Installation Technology Transition Program, researchers at the Engineer Research and

Development Center and NTC Operations Group staff explored a hybrid renewable energy alternative. They contracted the services of a systems integrator, SkyBuilt Power, to develop and demonstrate two deployable-renewable energy power system designs.

Initially, the D-REPS were to be used at NTC's Forward Operating Base Miami. This off-grid power solution uses the Mojave Desert's ample solar radiation and high winds to produce electricity and minimize the use of a backup fossil fuel generator.

Demonstration

D-REPS are designed to provide up to 7 kw of power for various Army tactical electrical loads. Each D-REPS includes 5 kw peak of solar array, 80 deep cycle batteries totaling 1,000 amp-hours, two 900-watt wind turbines, two 3.5-kw inverters, and a back-up 8-kw propane generator.

One of the D-REPS was designed to fit inside an easily transportable, standard 20-foot shipping container, and the other was trailer-mounted. Both units were operational and providing performance data by summer 2008.

In spring 2009, the shipping container D-REPS was moved from FOB Miami to an area called Moose Gardens. To date, the propane generators have been brought online only for testing procedures. The solar array and wind turbines are the only sources for maintaining the charge on the battery bank, which ultimately provides power to the loads through the inverters.

Advantages

The D-REPS demonstration is a major step forward in the Army's effort to both

reduce fuel consumption and minimize fossil-fuel emissions. Army studies show that technology transfer from fossil-fuel to renewable energy is necessary and an optimal choice for various missions such as communications, instrumentation, weather monitoring, target operations, environmental emission monitoring and training missions on urban terrain.

D-REPS can also mitigate lawsuits against the Army where environmental monitoring shows a post to be in violation of air quality standards. When compared to the cost of grid-tied power solutions for remote locations, D-REPS provides the right power in a more cost-effective manner.

Perhaps the most compelling rationale for the continued development and expanded use of the D-REPS capability is force protection. Use of these systems in theater means reduced diesel fuel consumption, fewer fuel convoys that are one of the most vulnerable tactical activities in the battle space and, as a result, fewer casualties.

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Roch Ducey is a senior project manager, ERDC's Construction Engineering Research Laboratory, Champaign, Ill. Kelly Dilks, is a researcher, ERDC-CERL, who is on a long-term assignment at the Office of the Assistant Chief of Staff for Installation Management. Bruce O'Dell is deputy director, Instrumentation and Information Systems, NTC Operations Group, Fort Irwin. 



A shipping container D-REPS is set up at Fort Irwin. Photo courtesy of Roch Ducey

Acronyms and Abbreviations

CERL	Construction Engineering Research Laboratory
D-REPS	deployable-renewable energy power system
ERDC	Engineer Research and Development Center
FOB	Forward operating base
NTC	National Training Center

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employs allows us here at Schofield Barracks to provide a high level of service economically ... as well as to free up personnel badly needed for other assignments."

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Paul J. Schuler is with GE Water and Process Technologies. 



Pump it up! Savannah District brings geothermal to Fort Gordon

by Tracy Ammons

Nearly 255 feet under the red Georgia clay at Fort Gordon, the U.S. Army Corps of Engineers, Savannah District, is making an impact on heat and energy. In September, the district completed an innovative geothermal heat pump project that will lead to long-term energy savings for Fort Gordon.

Geothermal heat pumps are significantly more efficient than standard furnaces and air conditioning units because they use the thermal properties of the Earth to generate heating and cooling. The long-term result is considerably lower energy bills — between 30 to 40 percent lower — according to estimates from the Environmental Protection Agency.

“Basically, we use the Earth as a giant heat source in the winter and a heat sink in the summer,” said Bonnie Terrill, Fort Gordon energy manager.

Awarded last September to ARS Mechanical of Conyers, Ga., the \$1.7 million project converted 11 buildings, totaling 32,500 square feet, from traditional energy systems to deep-well geothermal heat pump systems. The office buildings house several organizations, including the Army Recreation Machine Program and the Army and Air Force Exchange Service.

“This is a smaller project, but it is just as important,” said Ruben Del Rio, project manager. “It’s providing a way to save energy and to concentrate research to protect our environment. So, it ultimately does serve the Soldier.”

The contractor drilled 16 holes about 255 feet deep around each building and installed high-density polyethylene piping into each hole, said Nolan Eusebio, project engineer. Then, the workers trenched and installed HDPE closed-loop piping around the perimeter of the building, connecting each well.

HDPE piping is a strong, durable plastic that allows heat to pass through efficiently. The pipes are filled with water, which circulates through the loop and carries heat

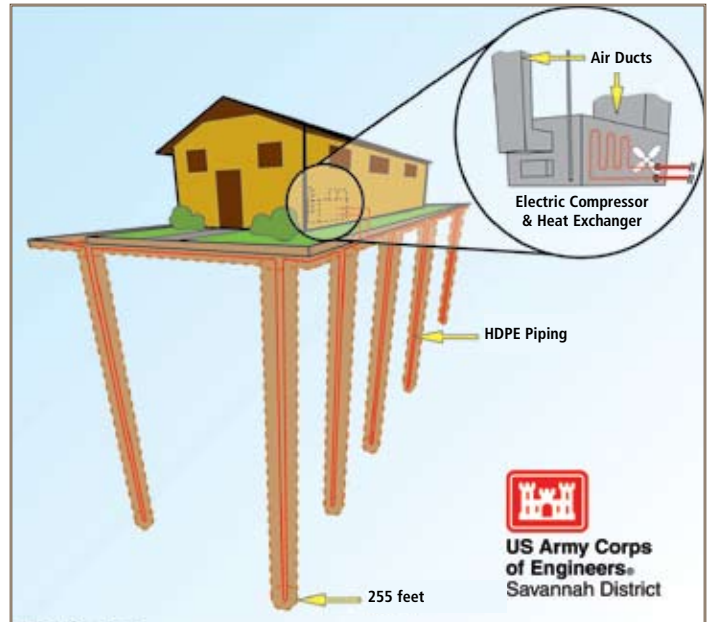
between the ground and the building.

“Next, they set the actual heat pump units in place and routed the water supply and return HDPE piping into the building,” Eusebio said. “They connected the units to copper piping with a pump to keep the water circulating. Then, all pieces of equipment needing power are wired so they can be monitored and controlled remotely at Fort Gordon’s Department of Public Works.”

In winter, the system moves heat from the Earth into an electric-powered compressor and heat exchanger, which condenses the geothermal energy and releases it throughout the building at a higher temperature. In summer, the process is reversed. The system draws excess heat from inside the building, and the underground piping carries the heat deep into the ground for the Earth to absorb.

Geothermal heat pumps are four times more efficient than standard furnaces, because they don’t burn fuel. And unlike air conditioning units and standard heat pumps that use the air as a heat-exchange source, geothermal heat pumps remove heat from water deep in the Earth. Since water is denser than air, more heat can be pulled from water with less energy.

“This project was selected because it is a renewable energy source,” Terrill said. “Plus, these buildings are remote enough that they can’t use the post’s chilled water



This diagram illustrates the deep-well geothermal heat pump system at Fort Gordon. Graphic by George Jumara, U.S. Army Corps of Engineers, Savannah District

system. Ground-coupled [geothermal] heat pumps were the most cost-effective option.”

The project was funded by an environmental grant from the Energy Conservation Investment Program. Under the terms of the grant, the project’s energy cost savings will pay back the project’s cost in about nine years.

Fort Gordon is likely to see more green construction.

“ECIP funding is awarded annually, and Fort Gordon’s submitted projects are often among the winners,” Terrill said. “Not only are we meeting our energy conservation goals, but in years past, Fort Gordon has won both second and first place Secretary of the Army’s energy conservation awards. We are proud to go green for our environment, our Soldiers and our nation.”

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Tracy Ammons is a public affairs specialist, U.S. Army Corps of Engineers, Savannah District.



Acronyms and Abbreviations

ECIP	Energy Conservation Investment Program
HDPE	high-density polyethylene



Armenia water works

by Justin Ward

More than most people, Armenians value water. In the late Bronze Age, the Assyrians dubbed Armenians *Nairi*, or the people of the lakes and rivers. Every July, the country celebrates National Water Splashing Day, called *Vardavar*, when citizens douse each other — sometimes total strangers — with bucketfuls of water. In fact, one of the most popular sites in the country is Lake Sevan, one of the largest high-altitude lakes in the world.

And yet, clean water is scarce.

About 50 to 60 percent of clean water is lost due to breaks, leaks and gaps in the country's disjointed network of pipes. In the capital, Yerevan, water flows from the tap only a few hours a day. The fear of water contamination is real.

To combat this crisis, the Office of Defense Cooperation in Yerevan teamed with the U.S. European Command and the U.S. Army Corps of Engineers to execute six fully functional, turnkey water systems throughout the country as part of a single humanitarian assistance project. Through EUCOM, ODC gained approval, funding and ultimately the Corps of Engineers' support for this mission.

"These are six separate projects that help six separate communities throughout the country," said Charles Samuel, Caucasus Project Office chief, who is overseeing design and construction. "Together, they make a statement that the U.S. values its friendship with Armenia and is willing to help them in any way we can. I'm just happy to be a part of the team making that happen."

In accordance with current host nation building standards and codes, the \$600,000 undertaking — collectively called the Renovation of Public Water Supply System — seeks to partially or fully reconstruct the existing water supply systems near the villages of Aghavnavank, Antaramej, Karmir-Aghek, Sevkar, Ttou Jour and Vaghashen.

This includes disassembling, rehabilitating and constructing reservoirs, fences, catch basins, wells and roughly 14 miles of intercommunity pipelines to assist the villages, which have a combined population of just over 9,000.

"We're talking thousands of people who — some for the first time in their lives — will now have clean, fresh water," said Samuel. "That, to me, is a truly amazing contribution."

The project was introduced by CARD, the Center for Agribusiness and Rural Development, a nonprofit, nongovernmental organization originally created by the U.S. Department of Agriculture to solve agricultural and irrigation problems in Armenia. Executing the project is CESCO Co. Ltd., a construction and engineering services company based in Yerevan.

According to Samuel, CESCO, which normally provides heating, ventilation and air-conditioning services, is on target to deliver all six projects by the end of the year — on time, on scope and on budget. CESCO's work also includes the design, delivery, installation, renovation and connection of utilities.

"We're really very pleased and impressed," Samuel said about CESCO's work. "Their ability to adroitly handle a variety of complicated water problems in a variety of remote regions throughout an already remote country is impressive, to say the least. It's one of our greatest success stories."

In addition to providing an adequate and sanitary water supply to the people of the six remote communities in the mountainous and seismically active regions of central Armenia, the water systems create the potential for an enhanced local economy through increased irrigation, improving the local's capacity to help themselves.

"Building partner nation capacity is our watchword at EUCOM," said Charles



Water and sanitary lines near Sevkar, Armenia, are undergoing significant refurbishment, replacing old, rusted and disconnected waterlines and reservoirs with new pipes, fencing and connections, giving roughly 9,000 Armenians fresh water from their taps. Photo by Nana Kacheishvili, U.S. Army Corps of Engineers

Brady, EUCOM humanitarian assistance program manager. "We are fortunate to be able to contribute to an improvement in Armenia's ability to help people."

Recently, the World Bank, U.S. Agency for International Development and others financed millions of dollars in water system rehabilitations in Armenia, said Maj. Edward Keller, bilateral affairs officer with ODC. While these have led to improved supply, quality and financial viability of the water utilities, they have mostly focused on Yerevan.

"This water project extends EUCOM's reach of assistance [to] these villages," said Keller, who is serving as part of Kansas' Army National Guard's State Partnership Program. "[We] have also been active with renovations to schools and hospitals."

Armenia and Azerbaijan are both U.S. coalition partners that have allowed unconditional use of their airspace for support to operations in Afghanistan. Both countries have sent troops to support overseas contingency operations in Kosovo and Iraq, with Azerbaijan being the first Muslim nation to do so.

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Justin Ward is the chief, Public Affairs, U.S. Army Corps of Engineers, Europe District.

Acronyms and Abbreviations	
EUCOM	U.S. European Command
ODC	Office of Defense Cooperation (Armenia)



Building strong leaders

by Lt. Gen Robert L. Van Antwerp

Recently, I had the privilege of participating in the induction of five new Senior Executive Service members into the Corps of Engineers Family. During this ceremony, I used an analogy about the keystone in an archway to describe how critical our SES leaders are to our mission.

The arch is not complete without the keystone, which sets the arch firmly into the framework to survive the elements and anything we can throw at it. From the foundation up to the keystone, each and every stone plays a role, until that final keystone is slid into place. That stone, especially, has to be the right shape, the right size and just the right critical mass to ensure that the entire arch is strong.

The same analogy applies to developing our work force. The keystone represents my proponent staff led by Robert Slockbower, the Career Program 18 functional chief representative. For the FCR keystone to do his job, he has to have the support of those anchor stones to the left and to the right.

On the left are the activity career program managers across the Army who work in collaboration with commanders to further the goals and objectives of the CP-18 program. Information is disseminated through them to the division and installation levels to ensure that we communicate and share knowledge. They are also tasked with ensuring that our interns and journeyman are aware of the Master Intern Training Plan and the master training plan for their respective series.

On the right are the supervisors who shoulder the difficult job of managing and



Lt. Gen. Robert L. Van Antwerp
Photo by F.T. Eyre

developing each careerist starting at the intern level. All supervisors need to be aware of the requirements of the MITP and the MTPs, which are developed out of the unique competencies for each series. In addition and most importantly, they must be familiar with their respective command leadership development programs and the Army Leader Development Program.

During the CP-18 workshop in July, the results of the first CP-18 journeyman survey were presented and discussed. The survey had been sent out to determine where we are and how we are doing in developing and training our work force. More than 800 people participated, and their input has proven invaluable.

More than 75 percent of the respondents reported that they had five-year individual development plans and that they routinely discussed their

training with their supervisors. However, the survey also revealed that more than 80 percent of the respondents were not aware of the Army Civilian Training, Education and Development System programs, the CP-18 web site or professional development maps. Nor had they heard of the Civilian Education System leadership development program.

What this tells me is that we have a significant delta to overcome in getting the word out to everyone and ensuring that those programs are incorporated into IDPs.

You may be familiar with the legacy courses, such as Professional Personnel Management for Executives I and II, Organizational Leadership for Executives and others. In 2007, the Army began phasing out these courses and, instead, introduced a new tiered development training framework that has eight levels, all of which are centrally funded through the Army Management Staff College.

The eight courses are offered as resident classes, through distance learning or a combination of both. The training web site, <http://www.train.army.mil>, provides a great deal more information about each of these classes, which are available to all Department of Defense civilians and military members.



Just as a keystone must be the right shape, size and critical mass to ensure that the arch is strong, so should future leaders shape themselves through training for the crucial tasks ahead. Photo by Mary Beth Thompson

Acronyms and Abbreviations	
ACPM	activity career program manager
CES	Civilian Education System
CP-18	Career Program 18, Engineers and Scientists – Resources and Construction
FCR	functional chief representative
IDP	individual development plans
MITP	Master Intern Training Plan
MTP	Master Training Plan
SES	Senior Executive Service



Career Program 18 holds annual workshop

by Donna W. Crawford and Dorothy C. Smith

For 109 interns, journey-level employees, activity career program managers, supervisors and Senior Executive Service members, Texas in the middle of the July was the right place at the right time to participate in the annual Career Program 18 Development Workshop.

Robert Slockbower, CP-18 functional chief representative, served as keynote speaker and master of ceremonies. James Dalton, chief of the Corps of Engineers' Engineering and Construction Community of Practice, led an in-depth discussion on

the Facility Engineer Career Field.

Dynamic speakers addressed the attendees, including Robert E. Neilson, the Army's strategist who developed the Army's Knowledge Management Principles. Terry Placek, chief, Comptroller Proponency Office, discussed the CP-11 Program, which is widely viewed as a model.

Plenary sessions covered the CP-18 Program, the Leadership Development Program, developmental assignments, civilian education, strategic communications and the results of the intern and journeyman surveys. Breakout sessions covered mentoring, best practices, the Master Intern Training Program, ACPM tools, the Army Civilian Training Education and Development System, and competitive

professional development.

This annual workshop provides a forum for CP-18 careerists across the Army to receive updates on program and Army initiatives, and training in key areas. The 2010 CP-18 Workshop will be held in San Antonio March 30-April 1. Information about the hotel, registration and topics will be posted on the CP-18 website, <https://ekopowered.usace.army.mil/cp18>.

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Donna W. Crawford and Dorothy C. Smith are the CP-18 Proponency staff, Headquarters, USACE.



Acronyms and Abbreviations	
ACPM	activity career program manager
CP-18	Career Program 18, Engineers and Scientists – Resources and Construction
USACE	U.S. Army Corps of Engineers

(continued from previous page)

- The **Foundation Course** is mandatory for all interns and for new Army employees.
- The **Action Officer Development Course** is mandatory for all interns. The course, delivered via distributed learning online, targets employees in GS 5-9 entry level positions or their pay band equivalents.
- The **Supervisor Development Course** is required for newly appointed Army civilians and military supervisors of Army civilians in GS 7-9 and above positions or their pay band equivalents. This course is delivered via distributed learning online.
- The **Basic Course** is a two-week resident course at Fort Leavenworth, Kan., that includes a web-based module that must be completed prior to the resident phase. Target attendees include GS 11 and above civilians or pay band equivalents who are team leaders or supervisors.
- The **Intermediate Course** targets GS 11-14 employees or pay band equivalents who are direct and indirect supervi-

sors, including military supervisors of civilians. The training entails a two-week resident course at Fort Belvoir, Va., and a web-based module that must be completed prior to attending.

- The **Managers Development Course** is required for newly appointed managers whose responsibilities include managing the work of subordinate supervisors. The target audience is GS 12 and above or pay band equivalent civilians. This course is delivered via distributed learning online.
- The **Advanced Course** is a three-week resident course at Fort Belvoir that also has a web-based prerequisite. The target audience is GS 13 and above or pay band equivalent senior-level civilians and military supervisors of civilians.
- **Continuing Education for Senior Leaders** consists of 40 hours of distance learning and a one-week resident course at Fort Belvoir that focuses on current issues and challenges. The target audience is GS 14 and above or pay band equivalent employees.

Some of you may have taken one or more of the legacy courses. Part of the

program is an equivalency matrix that allows you to determine which courses you need to take or that your careerist needs to take. Applicants for senior service colleges must demonstrate completion of the CES courses or their equivalents to be considered eligible.

I encourage each of you to visit the CES web site, <http://www.amsc.belvoir.army.mil/ces>, to learn more. Further, I challenge each ACPM, district, installation, division and region to initiate a CES communication drive to increase the CP-18 participation levels 20 percent by October 2010.

Part of the path to *Greatness* — whether you want to achieve that keystone level of SES or not — is following the prescribed training and developmental activities to ensure that when the time is right, each of you is the right shape, size and critical mass to slide into that arch as an Army leader. Building Strong through building strong leaders!

Lt. Gen. Robert L. Van Antwerp is chief of engineers, commanding general of the U.S. Army Corps of Engineers and the functional chief of CP-18.





Balocki leads Corps' environmental community

by Candice Walters

When you ask retired Col. James B. Balocki to talk about his experiences throughout his 28-year Army career that make him uniquely qualified to be chief of the U.S. Army Corps of Engineers Environmental Community of Practice, he'll talk about having seen life from both sides of the street.

Balocki has worked at basically every level of the Army. He served in three Corps of Engineers' districts, as a director of Public Works at an Army installation and as an installation commander, and has worked at both the Army staff and secretariat levels.

He plans to tap into some of that background as he sets the course for the future of the Environmental Community of Practice.

Balocki learned about the environment first hand as an installation commander overseeing a 76,000-acre post. He spent time in the field there, learning directly from his staff the challenges associated with balancing the need to train units with the need to sustain the environment.

"I tend to look at my cumulative life experiences and believe that I will draw upon them and apply them in my current job," he said. "I've had the opportunity to see things from multiple perspectives and probably do have some greater insight into the challenges and opportunities present in each party's expectations of one another."

But Balocki does have a caveat.

"While that can be helpful," he said, "the truth is that reality changes. A recent article in *Business Week* [week of Aug. 3] pointed out that the mistake made by many leaders who have failed in the recent financial crisis is that they became overconfident in their abilities as they moved up and didn't question their assumptions or look at what was changing around them.

"So, while individual experiences are important, they really are just snapshots in time. They may or may not be applicable to



James B. Balocki
Photo by John Hoffman

the present situation. I believe you always have to question your experiences, to stop and realize what you can and can't apply."

What he plans to apply now — having just come on board July 20 after serving as head of the Army's Base Realignment and Closure Division, as director of the Army's Environmental Programs and as executive officer to the assistant secretary of the Army for civil works — is the ability to listen.

"You have to listen — to your constituents, stakeholders, commanders, customers. They should drive what it is we do. We have to be responsive to their needs because we enable our customers to do what it is they need to do to accomplish their mission," he said.

And Balocki uses the word "enabler" when talking about how the Corps Environmental Community of Practice should be viewed by the Army Public Works community, the Corps Civil Works community and the Armed Forces as a whole.

"The Environmental Community of Practice is a resource for anyone inside or outside of the Army family and anywhere where environmental solutions are sought," he said. "We have resident expertise where we can leverage skills and core competen-

cies of the Corps' team to enable institutions to succeed in executing their mission, whether that is to provide realistic training, enable quality installations or support our warfighters in the field.

"Clearly our environmental mission is to care for the natural resources that the infrastructure is dependent upon for both the training and quality of life that are vital to installations," he said.

"But the mission doesn't stop there, because we also are charged to clean up and return property to beneficial use for the American public as well as to manage the natural resources associated with our vast Civil Works mission," he said.

Balocki said he is still learning his responsibilities, but his initial assessment is that his key responsibilities are communications and relationships.

"It gets back to listening to find out the needs and requirements of those we serve," he said.

Balocki is especially excited about working with the people in the Corps, which he calls the nation's environmental engineer, and especially those who comprise the Environmental Community of Practice, a multi-disciplined workforce of about 6,000 environmental professionals.

"Every morning when I wake up, I think about the great people who are doing things in our business, mostly those whose efforts are largely unrecognized," he said. "I want to celebrate, identify, recognize, promote and encourage those people who do that work for us every day. That gets me excited — the unparalleled and unequaled potential of people. That's a guidepost for me.

"The greatest joy I get is when someone gets a promotion, and you know that the training and experience they got when working for you got them to the next level. That's gratifying."

A registered professional engineer in the Commonwealth of Virginia, Balocki holds a bachelor's degree and a master's degree ➤



Volkman to be honored by Association of Energy Engineers

by Mary Beth Thompson

Paul Volkman will receive the *AEE 2009 International Award for Energy Professional Development* at a banquet Nov. 4 in Washington, D.C. Volkman is the Energy and Utilities Program manager, Headquarters, Installation Management Command.

A recognized leader in energy management, Volkman is being honored by the Association of Energy Engineers for promoting professional development among Army and private industry professionals. He has sought out energy saving programs that promote and encourage energy professionals and organizations to save energy, and he has rewarded those professionals and organizations by promoting awards and training.

Volkman advanced the Army's professional development of its energy managers by seeking out commercial training opportunities where available or developing his own courses to satisfy the needs of the Army.

He developed and hosted five IMCOM Energy Summits to encourage garrison-level energy conservation, efficiency and implementation of renewable energy. These summits have produced more than 20 noteworthy energy projects, including several renewable energy projects.


He funded certified energy manager training annually for the last four years through AEE, training more than 175

energy professionals, and will offer certification courses in building commissioning, measurement and verification, energy auditing and lighting efficiency this December as part of IMCOM Energy Summit VI.

In the past two years, he presented papers at major energy conferences and training sessions more than five times. Volkman also serves on committees and working groups that help develop legislation, policy and guidance.

The awards banquet will be held at the Walter E. Washington Convention Center in conjunction with the 2009 World Energy Engineering Congress.

For information about the congress, visit the AEE web site, <http://www.aeecenter.org>.

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



Paul Volkman speaks at a conference in January. Photo by Mary Beth Thompson

Acronyms and Abbreviations

AEE	Association of Energy Engineers
IMCOM	Installation Management Command

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in civil engineering from the University of Washington, a master's degree in systems engineering from the University of Southern California and a master's degree in national and strategic studies from Quad-i-Azam University, Islamabad, Pakistan.

Candice Walters is a public affairs specialist, Headquarters, U.S. Army Corps of Engineers.



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