Fort Irwin Energy Efficiency Improvement Program

U.S. Army Forces Command installation reduces energy use by over 40% through a unique private/public partnership, exceeds mandated energy reduction goals ahead of schedule

Technical Assistance

Success Story

The Federal government is the single largest consumer of energy in the United States, spending billions of dollars on energy annually. The Energy Policy Act of 1992 and subsequent Executive Orders requires that energy consumption in the Federal sector be reduced by 35%, from 1985 levels, by 2010. The United States Army Forces Command (FORSCOM) is working with the U.S. Department of Energy's (DOE's) Federal Energy Management Program (FEMP) to meet these energy goals. One such project was conducted at Fort Irwin, California, to set up a private/public partnership at the fort to reduce energy use.

Fort Irwin, located 37 miles northeast of Barstow, California, is roughly halfway between Los Angeles and Las Vegas. The installation is home of the U.S. Army National Training Center (NTC). Fort Irwin covers 635,052 acres of land in the Mojave Desert. The main post area covers approximately 2,500 acres. Over 3,700 active duty military personnel are assigned to the installation along with 4,300 family members. The installation also employs approximately 2,400 civilians. The average workday population is 10,000 people.

In 1985, the baseline year, Fort Irwin consumed 348,958 million Btu (109,000 Btu/ft^2) of energy in its buildings and surrounding spaces. Energy costs approached $1 million per month during the peak summer months in this hot, desert environment. By the end of fiscal year 1995, Fort Irwin had achieved a 30% energy reduction—10 years ahead of schedule. In FY97, Fort Irwin had further reduced its energy use to 63,000 Btu/ft^2, a reduction of 42%! The overall cost avoidance to the installation over the past five years exceeds $14 million.

"We are setting the standard for and breaking records in the race to conserve natural resources and protect our environment. We are aiming for a 50% reduction before we are through."

—Rene Quinones, Energy Manager, Fort Irwin Directorate of Engineering and Housing

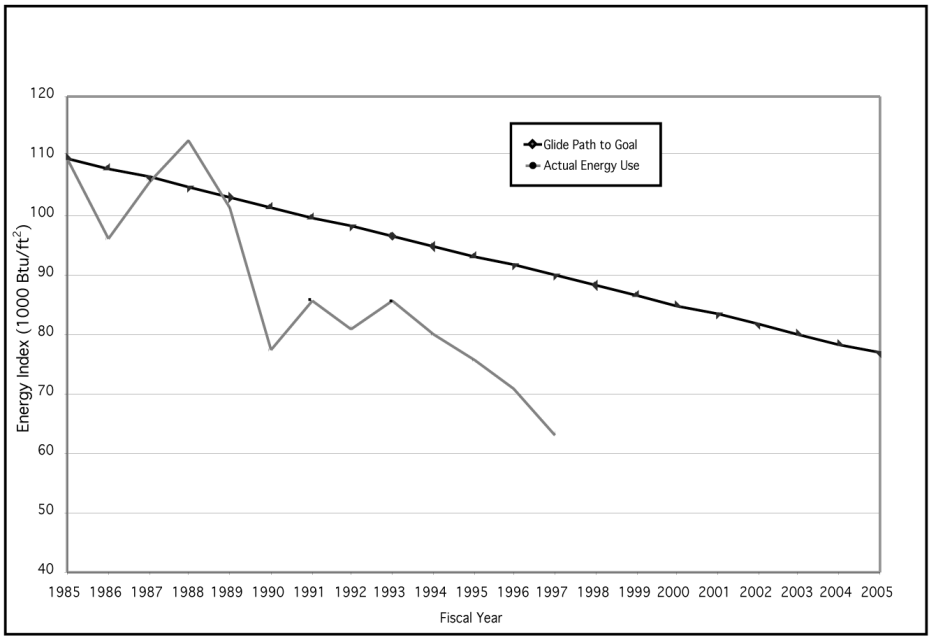
How was this accomplished? How was it financed?

This remarkable achievement was the result of a systematic approach for identification of cost-effective energy projects, followed by an aggressive program of implementation supported by Southern California Edison (SCE) and Edison ENVEST, a division of SCE.

The U.S. Army Forces Command/Fort Irwin's commitment to excellence is setting the standard for energy efficiency improvement and conservation of natural resources for Federal facilities.

The Fort Irwin Energy Conservation Program was a collaborative effort by the U.S. Army Forces Command (FORSCOM)/Fort Irwin and the U.S. Department of Energy's Pacific Northwest National Laboratory, the U.S. Army Corps of Engineers-Huntsville, and Southern California Edison. FORSCOM was able to use the capabilities of the Pacific Northwest National Laboratory through a cost-reimbursable agreement with DOE's Federal Energy Management Program.

National laboratories assist Federal agencies implement cost-effective solutions under the DOE Work-for-Others program



Annual energy use at Fort Irwin since the baseline year of 1985.

Begun in 1990 as a program to characterize Fort Irwin's baseline energy use, the Pacific Northwest National Laboratory's technical assistance to Fort Irwin grew into a multifaceted technical support and evaluation program covering all aspects of energy use and opportunities for energy conservation—from simple building weatherization to complex thermal storage and waste heat recovery projects. The Pacific Northwest National Laboratory's efforts resulted in:

- Completion of a base-wide energy assessment that characterized energy use and energy conservation opportunities (ECOs). This utilized Facility Energy Decision Screening (FEDS) software to prioritize potential ESOs based on their life-cycle costs.
- Identified and bundled ECOs into cost-effective energy projects.
- Development of a Comprehensive Five-Year Energy Project Implementation Plan that provided a roadmap for meeting the FY05 energy goal.

Some of the specific projects were funded under the Army's Energy Conservation Investment Program (ECIP), while others were funded by SCE, the electric utility serving Fort Irwin. The utility paid the initial capital investment for the energy projects, and was repaid through an added charge on the monthly electric utility bill covered by the savings generated from the energy efficiency project.

What were some of the specific energy projects?

New Family Housing Energy Efficiency: A new 220 unit family housing project completed in 1995 used state-of-the-art construction and technology to reduce energy consumption up to 50% over conventional military family housing. In 1995, this housing project was designated a "Federal Showcase Facility" for energy efficiency. Changes to the military construction specifications urged by Fort Irwin allowed these homes to be constructed with the following energy-efficient features:

- window overhangs to reduce solar heat gain in the hot summers
- solar window screens to further reduce heat gains and reflect direct solar radiation
- increased building insulation
- exclusive use of fluorescent lighting
- photocell technology on front door security lights and address lights
- low water flow plumbing fixtures
- ceiling fans to reduce energy requirements to condition the indoor space.

A unique distributed geothermal heat pump system for efficient space heating and cooling using a relatively cool underground water reservoir as the heat source/sink was also installed in these homes. SCE performed the initial research to design the geothermal heat pump system and provided three quarters of a million dollars to offset the incremental cost of the new system.

In addition to the above, this housing project was landscaped using native vegetation and computer controlled watering techniques, relying on in-ground sensors and weather forecasts to schedule watering frequency and duration.

Base-wide Relighting: The base-wide relighting project, completed by ENVEST in early 1997, consisted of:

- replacing old fluorescent fixtures with new energy-efficient fixtures containing T-8 lamps, electronic ballasts and specular reflectors,
- replacing 300 watt incandescent light fixtures with 68 watt T-8 fluorescent fixtures in warehouses, and
- replacing incandescent light with compact fluorescent lamps where practical.

These measures reduced the installation's annual energy consumption by an estimated 10 million kilowatt-hours, saving approximately $800,000 annually. Cost of the relighting effort ($5.5 million) was expected to be recovered from the energy savings in less that 7 years.

Setback Thermostats: Approximately 400 Lightstat® thermostats were installed by ENVEST in administrative buildings.

The Lightstat uses a light sensor that puts the HVAC system into the setback mode whenever the lights are turned off.

Infrared Heaters: The site-wide energy audit and subsequent assessment identified replacing the existing liquid propane gas (LPG) forced air heating units in maintenance shops, motor pools, and hangers with LPG-fired radiant heaters as an effective energy resource opportunity. Radiant heaters were installed in two 40,000 square foot maintenance shops at a cost of $30,000. ECIP funding was used to pay for this energy project.

Photovoltaic Power: In an energy project supported by SCE, 35 photovoltaic (PV)-powered streetlights were installed for personnel security and safety along perimeter streets in the residential area of Fort Irwin where running conventional power was not practical. A guard station at the post landfill entrance was converted to PV power. This PV system provides power for an evaporative cooler, small refrigerator, interior lights, security lights and the truck weigh station. Another 1,800 smaller PV systems were installed to power mechanized popup targets in the desert warfare training area of Fort Irwin.

Energy-Efficient Motors: New energy efficient motors (92% efficiency rating) replaced existing motors on 26 hot water circulation pumps (generally less than 15 horsepower) that operate continuously. Other motors are being replaced on failure with high-efficiency motors.

What is in the future?

The energy-efficiency improvement program at Fort Irwin continues. Additional future energy savings are expected from:

- the installation of a base-wide energy management control system
- optimizing the operation of a central chiller plant serving barracks, a dining facility, and several office buildings.

Yet to be determined is the feasibility of converting the fleet gasoline-powered vehicles to electric (battery and/or solar) or LPG operation.

Utilizing the National Laboratories for cost-effective solutions

Under the Economy Act of 1932, as amended (31 U.S.C. 1535), all Federal agencies have the ability to place orders for goods and services with another government agency when the ordering agency determines that it is in the best interest of the Government. The Economy Act was established so Federal agencies could meet their mission goals without the need for unnecessary duplication of effort. This also allows the requesting agency the ability to have access to highly specialized or unique facilities, services, or technical expertises that exist within DOE's national laboratory system.

The procedures for one Federal agency to place work with another Federal agency are outlined in Federal Acquisition Regulation 17.502, *Interagency Acquisitions Under the Economy Act*. The Department of Energy has implemented this regulation via DOE Order 481.1. Under that order, DOE accepts a request for goods or services if the requesting agency and the laboratory where the work will be assigned certify the following conditions have been met:

- A Memorandum of Understanding (MOU) must exist between DOE and the requesting agency.
- The request for goods or services is consistent with or complementary to DOE's missions and the mission of the laboratory performing the work.
- Acceptance of the work would not adversely impact the laboratory's execution of DOE-assigned projects.
- The proposed work would not place either DOE or the laboratory in direct competition with the domestic private sector.
- Work will be accomplished on a full cost-recovery basis.

This project was completed in compliance with the Economy Act to utilize the existing technical expertise of the Pacific Northwest National Laboratory in the most cost-effective manner in meeting the needs of the Department of Defense.

The guard station at the post land fill has been converted to 100% solar operation.

For More Information

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