# Increasing Energy Efficiency Through Innovative Delivery Methods – 14144

Darcy L. Immerman* and Anthony Roner**
*(AECOM, 66 Long Wharf, Boston, MA 02110 (darcy.immerman@aecom.com))
**(AECOM, 440 Stevens Avenue, Suite 250, Solana Beach, CA 92075 (anthony.roner@aecom.com))

## ABSTRACT

Executive Order (EO) 13514 builds on and expands energy reduction and environmental requirements of the 2007 EO 13423 by making reductions of greenhouse gas emissions a priority, and by requiring agencies to develop sustainability plans focused on cost-effective projects and programs. It adds to the Energy Independence and Security Act (EISA) of 2007, which requires comprehensive energy and water audits in 25 percent of covered facilities and a 30 percent reduction in energy use by 2030. When the EO and EISA were announced, funding was not made available to meet these mandates. Government agencies are embracing alternative financing and delivery methods to meet sustainability goals by reducing energy use and cost. In addition, these methods are being implemented to meet sustainability goals and reduce long-term maintenance and upgrade investment.

## INTRODUCTION

“As the largest consumer of energy in the United States economy, the federal government can and should lead by example when it comes to creating innovative ways to reduce greenhouse gas emissions, increase energy efficiency, conserve water, reduce waste, and use environmentally responsible products and technologies," said President Barack Obama when announcing Executive Order 13514 in October 2009.

EO 13514 requires agencies to measure, manage, and reduce greenhouse gas emissions and leverage federal purchasing power to promote environmentally responsible products and technologies. The EO also requires agencies to meet a number of reduction targets, including:

- 30% reduction in vehicle fleet petroleum use by 2020;
- 26% improvement in water efficiency by 2020;
- 50% recycling and waste diversion by 2015;
- 95% of applicable contracts will meet sustainability requirements;
- Implementation of the 2030 net-zero-energy building requirement;
- Implementation of the storm water provisions of EISA 2007

Given that the US federal government occupies nearly 500,000 buildings, operates 600,000-plus vehicles, employs more than 1.8 million civilians, and purchases $500 billion per year in goods and services, the energy reduction and related cost saving potential is significant. In addition to substantial energy cost savings, many of the contracting mechanisms being implemented to meet these goals will substantially reduce the cost of maintenance and equipment upgrades.

## DESCRIPTION

When the EO and EISA were announced, funding was not made available to meet these mandates. In the current global economic climate and amid shrinking capital appropriation budgets, government agencies are embracing alternative financing and delivery methods to save energy and water, and reduce waste. Innovative delivery methods include the following:

**Power Purchase Agreement (PPA)** is a long-term contract to buy power from an energy provider that uses its own source of funds to build an energy facility on government land, which it then owns,

maintains and operates for an extended term up to 30+ years. PPAs typically are structured to provide renewable power behind a customer's meter. The Army Energy Initiatives Task Force (EITF) is managing all large scale (10 megawatt [MW] or greater) renewable (solar, wind, geothermal and biomass) energy power purchase agreements for the Army and is using several contracting agencies to award these projects.

**Enhanced Use Lease (EUL)** is a method for funding construction or renovations on military sites. An EUL can be utilized to site renewable power generation on federal facilities for utility-scale generation, greater than the needs of the meter serving the federal facility. Like a PPA, the generation assets will be owned, operated and maintained by the developer. Given the amount of land that the Department of Defense (DOD) manages, there is a natural fit between developers of renewable energy (solar, wind, geothermal, biomass) and military facilities.

**Utility Energy Service Contracts (UESC)** offer federal agencies an effective means to implement energy-efficiency, renewable-energy, and water-efficiency projects. A utility arranges financing to cover a project's capital costs, which are repaid over the contract term from cost savings generated by the energy efficiency measures. The agency saves time and resources in using one-stop shopping provided by the utility.

**Energy Saving Performance Contract (ESPC)** is a method for public agencies to leverage private funds to implement energy-efficiency and renewable-energy projects. Upon project completion, the guaranteed energy savings are used to repay the Energy Services Company (ESCO) investment. The ESCO develops, designs, installs, and commissions the project, resulting in reduced energy use and cost in a client's facility. The ESCO arranges third-party financing for the project and must guarantee maximum project cost and projected energy savings. The project must produce neutral or positive cash flow for the client for the total contract term. The performance period for ESPC projects at Army facilities cannot exceed 25 years and must include the measurement and verification of savings for the performance period. Further, the base can utilize Operations and Maintenance, Army/Sustainment, Restoration, and Modernization (OMA/SRM) funding as a one-time savings to include additional energy conservation measures or reduce the contract term.

The ESPC method seems straightforward, but the projects are complex and the most successful are those that develop a partnership between base personnel and engineers, the ESCO, and the contracting agency. This public-private partnership model has become increasingly critical in meeting the challenge of shrinking capital budgets at military facilities. While reducing energy intensity, systems and infrastructure are upgraded, bringing the added benefit of meeting ever-changing mission demands. With a UESC in place, a local utility can provide energy services that are similar to an ESPC, but are typically less complex contractually.

While ESPC and UESC have been used for decades, base commanders and contracting officers need to understand this acquisition vehicle and how to obtain optimum energy and water reduction benefits.

A good example of optimizing ESPC benefits is the program at the US Navy's Space and Warfare Systems Center, Pacific (SSCPAC) in San Diego, a military campus consisting of 225 buildings with more than 3 million square feet. SSCPAC is the site of research, testing and evaluations for command, control, communications, computers, intelligence, surveillance and reconnaissance. The initial $12 million ESPC replaces older systems and is expected to result in energy cost savings of $23 million during the 19-year contract term.

Work includes lighting upgrades, water conservation measures, chilled water/air conditioning upgrades, a heating and hot water retrofit, upgraded air handlers, rooftop photovoltaic systems, and electronic control systems. Facility workers have noticed a more reliable and maintained air conditioning temperature and control in the lab spaces. Based on the success of the project's first phase, the SSCPAC/US Army Corps of Engineers (USACE) team recently awarded second and third task orders for another $22 million of energy improvements. Work will include central cooling plant upgrades, data center cooling and controls improvement to optimize temperature distribution, and additional lighting and domestic water energy-saving measures. SSCPAC showcases the importance of bundling together energy conservation and facility improvement measures. By combining short- and long-term paybacks, the facility leverages shorter payback items, such as lighting and controls, to implement longer term payback projects including building automation controls and infrastructure upgrades.

As Figure 1 below illustrates, the site had been very aggressive in using both appropriation and capital funds to reduce energy usage. Even with that type of diligence, the significant drop began in 2012 with the implementation of the ESPC program.

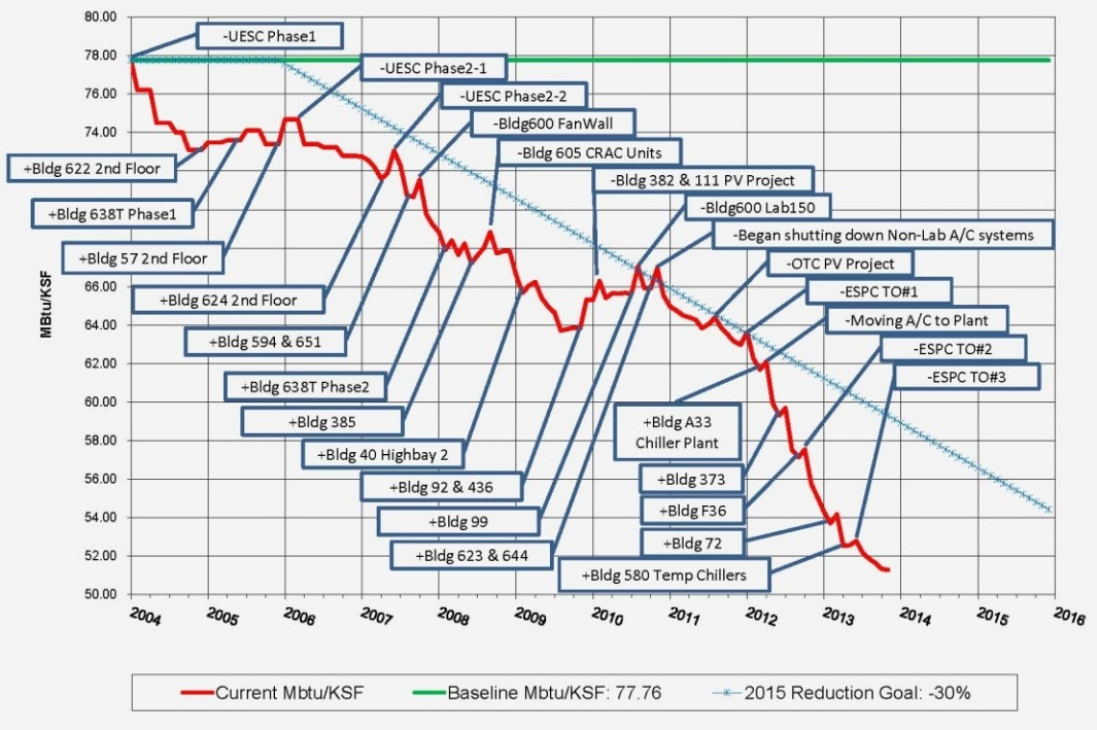


Fig. 1. Space and Naval Warfare Systems Center (SPAWARSYSCEN) Pacific Energy Reduction Progress FY 2003-2015.

In addition to these innovative financing tools, most agencies have limited appropriations available for energy projects. Oak Ridge National Laboratory (ORNL) recently conducted a study comparing various ways of using these appropriated dollars in combination with private financing. The study evaluated three strategies:

- Use of appropriated funds for the energy projects with the shortest paybacks, and private financing for as many of the remaining energy projects as are economically feasible (appropriations priority);

- Private financing for as many feasible energy projects as possible beginning with the shortest payback items, and appropriations used for long-payback projects (finance priority);
- Private financing with appropriated funds applied as an up-front payment (finance priority with buy-downs).

Among the study's findings was that the appropriations priority strategy limits the amount of investment – and the amount of energy savings – that can be obtained at a given site. As shown in Figure 2, if enough of the short-payback projects are done using appropriations, there comes a point when the remaining projects cannot be implemented at all using ESPC.

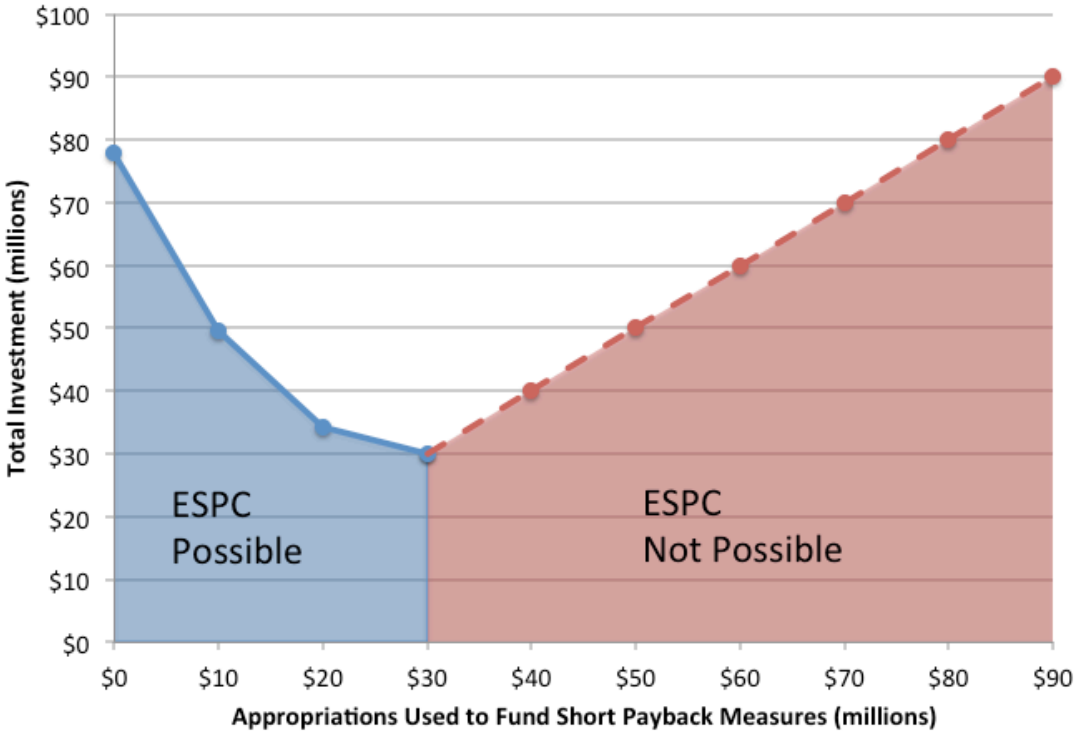


Fig. 2. Maximum possible investment for the Appropriations Priority strategy, in which appropriations are used to directly fund efficiency measures with the shortest paybacks, for the mix of ECMs defined in Shonder's report. The dotted line indicates the situation in which it is no longer possible to use private financing, because the savings will not pay off the investment within the statutory limit of 25 years.

The appropriations priority strategy has been found to have the highest life cycle cost as well. To maximize energy savings and minimize life-cycle cost, available appropriations should be used either as one-time payments in larger ESPC projects or to direct-fund the longer-payback measures that cannot be done economically using ESPC (Figure 3).

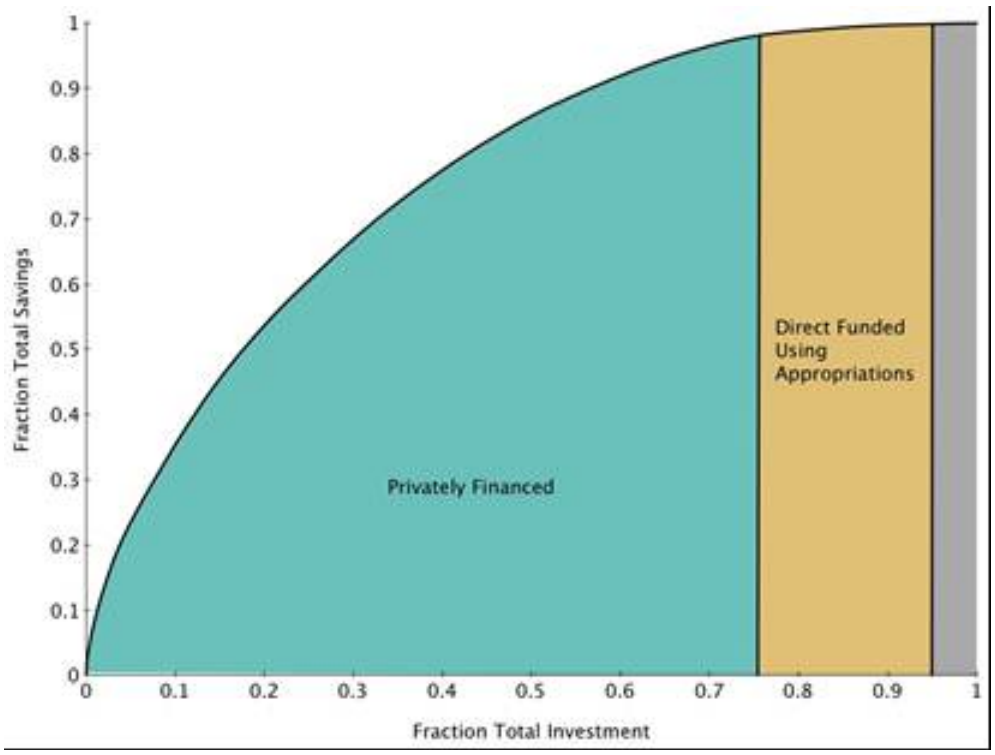


Fig. 3. Finance Priority.

Thus, the conclusion is that the practice of using appropriations to directly fund efficiency measures with the shortest paybacks limits the amount of energy savings that can be achieved. If an agency uses appropriations to directly fund short-payback measures, then the remaining measures generate fewer saving per dollar invested.[a] [1]

## CONCLUSION

When the EISA was enacted in 2007, it was the first time the US government publically acknowledged the link between our reliance on foreign oil and national security. It also made perfectly clear that the least expensive kilowatt is the one we do not use. During the same period of major efforts to reduce our energy usage, we suffered one of the worst economic downturns in history; yet, the demand for energy services continued to grow during the same period, due in large part to the acceptance of alternative financing options like ESPC, UESC and PPAs. And, as these contract models mature, and studies by ORNL and others expand the level of contract understanding, we expect a greater use of these contracts to meet the mandates established by executive orders and EISA while improving facilities and reserving appropriations for capital projects.

## REFERENCES

1. Shonder, J., "Mixing Appropriations and Private Financing to Meet Federal Energy Management Goals". ORNL/TM-2012/235, Oak Ridge National Laboratory, June 2013.

[a] The complete study is available at http://www.ornl.gov/sci/ees/etsd/btric/publications/ORNL%20TM%202012_235.pdf.

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