

Environmental Security Technology Certification Program (ESTCP)

**TECHNOLOGY DEMONSTRATIONS TO ACCELERATE
DEPLOYMENT OF ENERGY EFFICIENCY AND ENERGY RESILIENCE
SOLUTIONS**

OBJECTIVE

The Department of Defense (DoD) Installation Energy Test Bed seeks demonstration projects of innovative technologies and approaches to improve the energy and water efficiency of buildings on military installations. The demonstrations must be led by Energy Services Companies (ESCOs) or utilities that perform Energy Savings Performance Contracts (ESPCs) or Utility Energy Services Contracts (UESCs) for the DoD. Technologies should be commercially available but not currently widely deployed on military installations due to a lack of available data on system life-cycle cost and performance; or due to other uncertainties that pose a barrier to implementation through performance contracts. The demonstrations do not need to be integrated with current or planned ESPCs or UESCs or technologies and approaches that enable more efficient development and management of ESPCs/UESCs.

ESCOs are encouraged to consider technologies previously demonstrated by ESTCP but are welcome to propose any technology that meets the characteristics listed below. Demonstrations with the following characteristics are preferable:

- High likelihood of adoption of the demonstrated technology in future ESPC or UESC projects or through modifications to existing ESPCs or UESCs.
- Technologies that are commercially available, but not widely utilized due to lack of familiarity by ESPC stakeholders (DoD, ESCOs, utilities, financiers)
- Potential for high energy and water savings, improved facility performance, and/or enhanced energy security.
- Partnering with key stakeholders to enable shared learning and facilitate technology transfer.
- Cost sharing.

BACKGROUND

DoD invests hundreds of millions of dollars annually¹ through ESPCs and UESCs to improve facilities performance and reduce energy and water-related operations and maintenance costs. ESCOs are a key stakeholder in these projects and play a critical role in deployment of new technologies and solutions. The continued improvement of DoD facility and infrastructure performance is dependent on the application of new technologies and approaches to implementing projects; however, new technologies and approaches present a variety of real and perceived risks that need to be mitigated and shared appropriately between the project stakeholders.

¹ Office of the Assistant Secretary of Defense for Sustainment. *Annual Energy Management and Resilience Report Fiscal Year 2019*. <https://www.acq.osd.mil/eie/Downloads/IE/FY%202019%20AEMR.pdf>

ESPCs and UESCs are important tools that allow DoD to leverage third-party financing to implement energy and water projects, often with guaranteed savings. Demonstration projects provide key stakeholders an opportunity to get direct experience with engineering, integration and operations of new technologies and develop confidence in technologies ability to deliver the savings in a performance contract.

Below is a list of previously demonstrated technologies that are commercially available and may be appropriate for implementation through ESPCs or UESCs. More information about the technologies and project contact information can be found on the SERDP and ESTCP website (www.SERDP-ESTCP.org) by entering the project number in the search pane. Project numbers in parenthesis are related to the project numbered above it. (See appendix for project summaries)

<u>Controls and Sensors</u>	<u>Energy Security</u>	<u>Building Envelope</u>	<u>HVAC</u>
EW-201410	EW-201350	EW-201511	EW-201515
EW-201519			EW-201717
	<u>Energy Storage</u>	<u>HVAC</u>	EW-201721
<u>Water Efficiency</u>	EW-201514	EW-201344	EW-201724
EW-201518		(EW18-5280)	EW-201152
	<u>Lighting</u>	EW-201135	
<u>Energy Management</u>	EW-201718	(EW18-5311)	
EW19-5149	EW-201720	(EW19-5021)	
EW20-5205	EW-201722	EW-201338	
	EW-201141	(EW18-5363)	

The following technologies are not considered to be direct energy-savings measures but may be helpful as enabling technologies in development of ESPCs or other energy projects.

<u>Audit Tools</u>	<u>Cybersecurity and RMF</u>
EW-201260	EW18-5266
	EW18-5333
	EW19-5156
	EW-201609

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For pre-proposal submission due dates, instructions, and additional solicitation information, visit the [ESTCP website](#).

APPENDIX - ESTCP ENERGY AND WATER PROJECT SUMMARIES

Controls and Sensors

[EW-201410](#), Software-Defined Wireless Decentralized Building Management System: This wireless BMS targets small to medium sized buildings (<50,000 sqft) and has a low initial cost relative to other products in the market. The technology, demonstrated at Tinker Air Force Base, showed 25% electricity savings and 45% gas savings in the test buildings.

[EW-201519](#), Utilization of Advanced Conservation Voltage Reduction (CVR) for Energy Reduction on DoD Installations: This CVR technology was applied to the electrical distribution system at Joint Base Myer-Henderson Hall and generated savings over the 12-month test period of approximately 3.5%.

Water Efficiency

[EW-201518](#), Energy and Water Efficiency Improvements for Dishrooms in Military Dining Facilities: This project combined three technologies (wastewater heat recovery, optimized ventilation control and low-water usage dish machine) along with work-flow analyses to address human behavior inefficiencies. This combined solution was demonstrated at the US Army Garrison Presidio of Monterey dining facility and achieved a nearly 90% reduction in water use and approximately 50% energy savings with a simple payback of just over 2 years.

Energy Management

[EW19-5149](#), Demonstration of Intelligent Circuit Breakers for Energy Management, Verification, and Load Control: This technology, a low-cost tool for managing electrical loads, is being demonstrated at Naval Air Station Whiting Field to validate use-cases including energy resilience and energy project measurement and verification. The project is still in progress.

[EW20-5205](#), Demonstration of Siemens Embedded Micro Metering Module (SEM3) for Improving Installation/Facility Energy and Water Management: This technology is being tested at the Naval Information Warfare Center (NIWC) to evaluate integration costs and validate use-cases. The project is still in progress.

Energy Security

[EW-201350](#), Portsmouth Naval Shipyard Microgrid and Ancillary Services: This project demonstrated a Fast Load Shed microgrid controller at the Portsmouth Naval Shipyard. The technology allowed the shipyard's central combined heat and power plant to maintain power to critical loads while shedding non-critical loads during unplanned utility outages, thereby avoiding the time and cost associated with the manual black-start process of repowering the shipyard.

Energy Storage

[EW-201514](#), Latent Energy Storage Systems: This project demonstrated a phase-change thermal energy storage technology to reduce peak electrical demand and overall energy use from a chilled water cooling system. The technology was demonstrated at US Army's Fort Irwin and showed energy savings of over 7% and a 20% reduction in peak demand.

Lighting

[EW-201718](#), [201720](#) and [201722](#), Integrated Lighting and Controls: These projects demonstrated three different integrated lighting and controls technologies at different locations. All technologies demonstrated significant savings and identified key factors in determining cost-effectiveness. All sites were pleased with the lighting quality.

(Reference only) [EW-201141](#), **Dynamic Exterior Lighting for Energy and Cost Savings in DoD Installations:** This project demonstrated an exterior lighting technology for street lamps, parking lots and vehicle maintenance areas. The technology demonstrated in this project is now considered common and is not eligible for further demonstration. However, this project is listed here to provide an example of past successful demonstrations that supported broader deployment.

Building Envelope

[EW-201511](#), **Automated Aerosol-Sealing of Building Envelopes:** This project demonstrated a technology to seal building envelopes under certain conditions. Buildings ranged in size from 5,000 -50,000 square feet and were unoccupied during the sealing procedure. Energy and cost savings were evaluated using building energy models and showed simple paybacks near 5 years for buildings in colder climates.

HVAC

[EW-201344](#) ([EW18-5280](#)), **High Efficiency Dehumidification System (HEDS):** This project demonstrated an innovative cooling coil design that uses heat recovered from the return airstream and to efficiently control relative humidity of delivered air. This technology, originally demonstrated at Fort Bragg and Tinker Air Force Base, is currently part of an active demonstration to implement the technology through a Utility Energy Services Contract (EW18-5280).

[EW-201135](#) ([EW18-5311](#), [EW19-5021](#)), **Coupling Geothermal Heat Pumps (GHP) with Underground Seasonal Thermal Energy Storage:** The project demonstrated two different GHP designs (borehole and aquifer) more efficiently use the geothermal resource (geology or water) to provide facility cooling and heating. These systems, demonstrated at Marine Corps Logistics Base Albany and at Fort Benning, showed energy savings of nearly 50% compared to the baseline HVAC system performance and the borehole system was integrated with a dry-cooler to reduce water used in the cooling tower. For the 12-month demonstration period, this system saved over 4 million gallons of water that would have been used in the cooling tower. These designs concepts are the basis of two active projects to demonstrate that these solutions can be implemented through a Utility Energy Services Contract (EW18-5311 and EW19-5021).

[EW-201338](#) ([EW18-5363](#)), **Demonstration and Testing of an Energy Efficiency Ratio (EER) Optimizer System for DX Air-Conditioners:** This project demonstrated how the EER measurement and diagnostic technology can be used to cost-effectively improve direct expansion (DX) air-conditioning system performance. The technology, originally demonstrated at Marine Corps Air Station Beaufort (MCASB) and Cape Canaveral Air Force Station (CCAFS), is part of an active project to demonstrate how this technology can be used to enable performance-based maintenance contracts (EW18-5363).

[EW-201515](#), **Gas Engine-Driven Heat Pump (GHP) Cold Climate Field Demonstration:** This project demonstrated a GHP in a side-by-side comparison of an air-source cold climate heat pump (CCHP), both using a variable refrigerant flow (VRF) design. The technology was demonstrated at the Naval Station Great Lakes in North Chicago, IL and showed significant electrical demand and overall energy savings over the incumbent variable air volume system.

[EW-201717](#), **Next Generation Advanced High-Efficiency DX Air Conditioner Demonstration:** This project is currently demonstrating a high-efficiency DX air conditioner designed to increase system efficiency while minimizing unit cost. The technology is being demonstrated at Fort Irwin and Cape Canaveral Air Force Station and is scheduled to be

completed November 2021. Initial results from 12 months of performance data shows energy savings between 30-60% over baseline units with nameplate Integrated Energy Efficiency Ratios ranging from 6.7 to 10.2.

[EW-201721](#), High-Performance Air-source Cold Climate Heat Pump (CCHP): This project demonstrated a new CCHP to validate system performance in the field at the Maine Army National Guard Camp Keyes site. The CCHP showed an annual energy savings of approximately 40% over the baseline state-of-the-art heat pump with an estimated simple payback of less than 5 years.

[EW-201724](#), Nanofiber-based Low Energy Consuming HVAC Air Filters: This project demonstrated a nanofiber air filter to validate filter performance compared to standard commercial off-the-shelf (COTS) filters. The project is still in progress at Fort Benning and Fort Campbell, with preliminary results showing the nanofiber-based filters lasting nearly 2 times as long as equivalent MERV rated COTS filters with equal or lower pressure drop.

[EW-201152](#), Converting Constant Volume, Multizone Air Handling System to Energy-Efficient Variable Air Volume Multizone Systems: The project demonstrated a low-cost approach to retrofit a constant volume multizone air handling system to a more energy efficient variable volume system. This retrofit approach was applied to five systems at Fort Bragg and the US Army Engineering Research and Development Center – Construction Engineering Research Laboratory (ERDC-CERL). The energy savings from the retrofitted systems ranged from 25-60% and simple payback ranged from 5 years to greater than 10 depending on the baseline conditions.

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Cybersecurity and RMF

[EW18-5266](#), Facility-Related Control System Authorization Framework

[EW18-5333](#), Building Automation System Enumeration and Configuration (BASEC)

[EW19-5156](#), Low-Cost, Data Diodes for Protection and Monitoring of DoD Facility Equipment

[EW-201609](#), System Control Platform Enclave (SCPE)

Audit Tools

[EW-201260](#), Electronic Auditing Tool With Geometry Capture