U.S. DEPARTMENT OF
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Holistic Energy Management Yields Cost Savings and Resilience Benefits for the U.S. Coast Guard Academy

Figure 1. U.S. Coast Guard Academy campus.
Photo courtesy of U.S. Coast Guard.

As the U.S. Coast Guard's third largest energy consumer, the 86-year-old Coast Guard Academy in New London, Connecticut, was ripe for an energy management overhaul. That overdue overhaul was made possible by the largest utility energy service contract (UESC) in U.S. Department of Homeland Security history.

Awarded in September 2017, the $72.6 million UESC provided for $39 million in capital improvements and is expected to cut total energy costs by 80%—more than $2 million—each year. A large part of that savings comes from the switch to on-site generation for 82% of the site's electricity needs, which, in turn, has dramatically improved site-wide resilience. Savings generated from implementation of the project will pay for all project costs.

The project team developed and executed the UESC project to meet several priority objectives, including implementing essential infrastructure improvements, increasing reliability, and enhancing resilience. The team used a comprehensive approach, producing a 30-year forecast of the academy's energy and water demands and then prioritizing efficiency opportunities, maximizing available funding sources and financial incentives, and seeking to incorporate renewable energy. The investigation identified opportunities to reduce environmental liabilities associated with fuel oil storage, modernize electrical distribution campus-wide, and double the throughput capacity of chemistry laboratory fume hoods for students—benefitting all academic missions on campus.

Project Background

Situated on approximately 100 acres (Figure 1), the academy's size and aging infrastructure had presented challenges for the energy management team for many years. A piecemeal approach was not prudent, and more comprehensive solutions were too complex for academy staff implementation. It was clear to the project team that a more comprehensive approach was needed and that a UESC might be the right tool. Therefore, the Coast Guard awarded a UESC to Eversource, their serving utility. Eversource then competitively selected Ameresco, an energy service company (ESCO), as its implementer.

According to former Coast Guard Commander and Facilities Engineering Branch Chief Josh Fant, the UESC laid the foundation for the team to find innovative solutions in support of their objectives to "explore and identify opportunities that realize our commitment to resourceful readiness—a blend of affordability and mission sustainment. When we forecast that we are going to do major efficiency or infrastructure work, it is imperative that we simultaneously investigate additional prospects for sustaining operations and adding resilience."

Project Goals and Accomplishments

Initially, the main goal of this project was to facilitate switching the central boiler plant from fuel oil to natural gas. A thermal and load analysis of the boiler plant, however, revealed an economic opportunity to add a 1-megawatt combined heat and power (CHP) plant to supplement the new high-efficiency natural gas plant. The CHP system in turn yielded sufficient energy savings to modernize electric distribution, increase energy reliability, expand the central chiller plant, renew leaking roofs while installing rooftop solar photovoltaics, and implement 20 additional energy conservation measures.

These upgrades significantly strengthened the academy's energy infrastructure and supply—boosting energy resilience across the site. Key to the resilience effort were the CHP plant, improved electrical distribution infrastructure, and upgraded transformers. In addition, outlier buildings were connected to the main power network, and an alternate power feed was added to provide redundancy if one distribution line is compromised.

Replacing the oil boilers with natural gas boilers, and adding solar panels and CHP, represent a holistic approach that will allow the site to achieve its energy goals. For example, the Coast Guard Academy was able to eliminate the high operation and maintenance costs for the old boilers, as well as the liquid fuel costs associated with them—the cost of the fuel itself, the cost to preheat it, and the cost of delivery. Further, this switch alleviates an environmental health and safety concern: the fuel oil used in the old boilers was highly toxic, requiring special handling and cleanup of its containers. Replacing the old boilers not only saved energy and modernized the site, but also expanded on-site generation capacity while improving reliability and resilience.

Lessons Learned

An important contributor to the project's success was the strength of the partnership among the participants and the foresight of the energy management team. Several years before the project commenced, the team conducted an analysis of the operation and maintenance costs and estimated future costs and requirements, setting the stage for well-informed project development.

Benefits of Using a UESC

Acquiring the project through a UESC provided access to a highly experienced utility team, leveraged existing funds with financing, and provided the flexibility to integrate and execute planned improvements. Within the performance assurance planning and contract development, the team's efforts were guided by a priority objective of sustained performance and persistent energy savings. As a result, items covered in the UESC include maintenance, repair, and replacement for major equipment such as the boiler, the CHP plant, and the chiller plant. Additional emphasis was placed on the critical value of long-term maintenance and maintenance staff training; the contract includes 1,120 hours of training for maintenance staff on new equipment, including unique apparatus and new technologies. This entails funding for 22 years of continued maintenance with trained utility workers—a rarity in service contracts of this kind.

Ancillary benefits of the project include execution of planned capital improvements, such as replacement of the roof membrane at Roland Hall two years ahead of the original plan, and at a lower cost; tying three additional buildings into the central chiller plant; and removing existing decentralized cooling and heating infrastructure. By including this work, the UESC not only increased energy savings but expedited procurement, addressed the maintenance backlog, and dramatically simplified operations and maintenance requirements at the academy.

One of the most remarkable benefits of using a UESC for this project was its impact on the academy's mission. The Smith Hall chemistry laboratory needed replacement fume hoods that would allow students to work with petrochemicals, which are related to studies of oil spills. The contract allowed the project team to procure new hoods that will contribute more than 20% of the overall energy savings at the site. In addition, the modern hoods doubled student capacity in the lab, enhanced safety, and allowed for a more advanced curriculum to be taught, helping keep the academy aligned with top local institutions (Figure 2).

Conclusion

In addition to cost savings and modernization, the Coast Guard Academy project has already reduced total energy consumption at the academy by 16% (43% on a source basis) and water consumption by 7%, while enabling the academy to significantly reduce its vulnerability to grid power interruptions. While the Federal Energy Management Program provided UESC training and resource documents, the overwhelming success of the project is the direct result of the dedicated efforts of the project team.

Learn more about UESCs at energy.gov/eere/femp/utility-energy-service-contracts-federal-agencies. For questions about UESC technical assistance, email Tracy Niro at Tracy.Niro@ee.doe.gov. ■

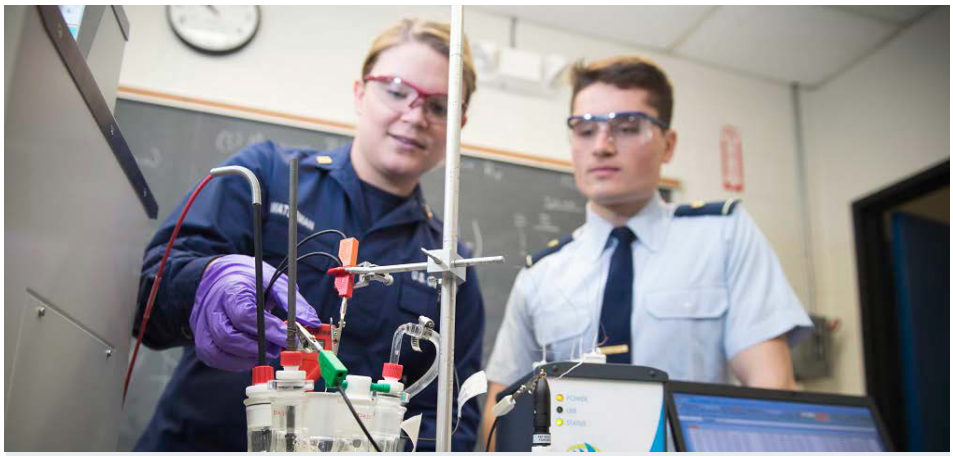

Figure 2. Cadets demonstrate experimental techniques in Smith Hall.
Photo courtesy of U.S. Coast Guard.

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