THIRD PARTY UPGRADES, OPERATIONS AND MAINTENANCE OF CAMPUS CENTRAL PLANTS

INTERNATIONAL DISTRICT ENERGY

CAMPUS ENERGY CONFERENCE – NEW ORLEANS, FEBRUARY, 2019

PROJECT EXPERIENCE

AMERESCO

Tufts University

Startup & Operations of Trigeneration Plant

Ameresco was selected to operate and maintain the new tri-generation heat, cooling and power plant for the Medford campus.

Our services include providing onsite staff responsible for system operation including a reciprocating engine generator, heat recovery and direct fired boilers, electric and absorption chillers, pumping and air handling systems, electrical switch gear and all related equipment.

Ameresco provides preventive, predictive and reactive maintenance along with annual testing, documentation and reporting.

Project Details

- The Tufts plant supplies electrical energy, low pressure steam, and chilled water to the campus.
- A Caterpillar 4 MW engine generator set supplies the electrical power.
- Three low pressure steam boilers and a HRSG steam generator supply steam year-round for heating needs.
- Chilled water is generated from an absorption chiller and an electric centrifugal chiller.
- Hot water for campus is produced via the cooling loop for the engine.
- New medium voltage electrical switch gear has been installed to serve the plant and campus needs

CHALLENGES OVERCOME AND LESSONS LEARNED

- Tufts
  - Urea injector location – If installed as designed, we would not have been able to remove the injector for cleaning. It was relocated after our suggestion.
  - Lube oil line to engine – Original installation had them running up high over engine. When Ameresco questioned the engine rep, they said the lines needed to be moved lower so oil would not drain back to engine sump and overflow it when engine shut off. This piping was corrected.
  - Make up water meter for chilled and condenser water appeared to be undersized, which was pointed out by Ameresco. These meters were changed and new meters function properly.
  - Blowdown piping for boiler water columns was not in the design and was added from our suggestion.

Novartis Institute for Biomedical Research

Central Utility Plant Operations

Ameresco was responsible for supporting the construction, commissioning, and startup activities of an optimized Central Utility Plant (CUP) with Combined Heat and Power (CHP).

Ameresco provides operation and maintenance to the CUP recently built for the Novartis Institute for Biomedical Research's 824,787 square foot Research Laboratory facilities in Cambridge, Massachusetts. This includes full time staffing under a long-term agreement.

Project Details

- Two Jenbacher natural gas fired reciprocating engine generators rated at 1.4 MW each
- Medium Voltage Switchgear
- Four 800-Ton Electric Chillers
- One 460-Ton Absorption Chiller
- Marley Cooling Towers
- NOx SCR & Urea Systems
- Steam/Hot Water Systems
- Vapor Phase Boilers

CHALLENGES OVERCOME AND LESSONS LEARNED

- Novartis
  - Low temperature cooling loop for engine not piped appropriately - design flow is 22 gpm but it was only getting 8 gpm
  - The compressed air panels for urea injection were too far away from injector. Needed to be within 59” of injector and they were 85’ away.
  - Chilled water bypass valve CV-22 has a pressure control valve installed, which should be just a butterfly valve. This valve controls nothing – simply gives chilled water a flow path when in free cooling. This incorrect valve application has caused multiple flow interruptions damaging expensive lab equipment.
  - The hot water back up for the absorption chiller was installed incorrectly. The source and return both come from the same location so there is no differential for water movement.
  - Installation of separate flow meters for the gas to each engine.
  - Installation of air monitoring in the plant and in the duct work for air intake.
  - Changed the plates on the domestic water heater so no contamination could happen if leak occurred.
  - HRB relief valve discharge- was discharging onto a walkway, had to redirect to a drain.
  - Cooling tower 1 supply valve actuator installed backwards

Bradley International Airport

Design, Build, Operate & Maintain CHP Plant

Ameresco designed and built, and now operates and maintains a 5.8 MW CHP plant to offset electric purchases from the local utility and to provide greater power reliability for a major expansion of the airport.

The CHP plant was initially constructed in 2002 with 3.9 MW of capacity and since expanded to the full 5.8 MW of capacity in 2010. Ameresco operates, maintains and repairs the mechanical and electrical equipment under a long-term agreement with the airport.

Project Details

- The electricity needs of the main terminal are met by the engine-generator. Due to equipment redundancy, the energy center can meet the main terminal's full electrical needs in the event of a loss of grid power.
- In addition, because heat recovered from the engines is used for absorption cooling in the summer and heating in the winter, overall energy costs are lower than a conventional heating and cooling plant.
- **Technology description:**
  - Four natural-gas fired reciprocating engines: three rich-burn engines installed in 2002 (two at 1.2 MW, one at 1.5 MW) with three-way catalysts for emissions reduction; and one 1.86 MW high-efficiency lean-burn engine installed in 2010 with an oxidizing catalyst
  - 13,000 MBtu/hr of engine heat recovery (230°F hot water)
  - Two 12,000 MBtu/hr dual-fuel hot water boilers
  - Absorption chiller

Philadelphia Navy Yard

Peaking Power Plant

Ameresco constructed a 6 MW power plant as part of the largest private microgrid in the United States at the former 1,200-acre Philadelphia Navy Yard.

Ameresco was responsible for design, engineering, and construction and will provide long-term operation and maintenance for the plant. The project is currently in the operations phase.

Ameresco also has completed work on a newly contracted expansion of the peaking plant, adding two megawatts (2 MW) of planned incremental capacity, increasing the total plant capacity to eight megawatts (8 MW).

Project Details

- The peaking plant is expected to run during the Navy Yard's peak demand periods and during intervals of high-cost energy and capacity from the grid.
- The plant will be capable of providing certain resiliency services and critical support in the event of extended grid outages, in addition to shaving the peak load requirements of the microgrid.
- The Project will allow PIDC to:
  - Reliably meet the projected demand growth needs of the Navy Yard and its tenants
  - Participate in the PJM Ancillary Service Market
  - Generate revenues to help offset the cost of the increased capacity

CASE STUDY

COMMUNITY COLLEGE OF RHODE ISLAND, RI

TECHNOLOGY TYPE:

ENERGY/WATER CONSERVATION

ENERGY SAVINGS PERFORMANCE CONTRACT

GUARANTEED ENERGY SAVINGS

FACILITY SIZE:

1.1 MILLION SQ FT (4 CAMPUSES)

ESPC ENERGY PROJECT SIZE:

$14.8 MILLION

ANNUAL CO2 SAVED:

4,900 METRIC TONS

ESPC ANNUAL ENERGY SAVINGS:

$1,200,000

The Community College of Rhode Island (CCRI) partnered with Ameresco to complete a series of infrastructure improvements to increase energy efficiency and save on annual costs.

This budget neutral project maximized efficiency of the CCRI campuses, enabling CCRI to apply cost savings from energy efficient equipment to help renew campus facilities and building systems.

CASE STUDY

ROXBURY COMMUNITY COLLEGE, MA

TECHNOLOGY TYPE:

COMPREHENSIVE ENERGY AND WATER UPGRADE

ENERGY MANAGEMENT SYSTEM

GEOTHERMAL HEAT PUMP

LED LIGHTING

SOLAR

TOTAL SOLAR PANELS INSTALLED PHOTOVOLTAIC SOLAR CANOPY:

3,000

ENERGY PROJECT SIZE:

$20 MILLION

GEOTHERMAL SYSTEM CAPACITY:

400 TONS

ANNUAL ENERGY SAVINGS:

$860,000

Roxbury Community College (RCC) partnered with Ameresco to address campus-wide energy upgrades, deliver energy savings, and reduce the college's carbon footprint.

Ameresco's work with RCC provided the college with clean renewable resources and energy cost savings. The generated savings allow RCC to direct more funds to other campus improvements.

CASE STUDY

ARIZONA STATE UNIVERSITY, AZ

TECHNOLOGY TYPE:

ENERGY ANALYTICS

ENERGY EFFICIENCY

COMBINED HEAT AND POWER

SOLAR PV SYSTEMS

FACILITY SIZE:

21.7 MILLION SQ FT (4 CAMPUSES, 1 RESEARCH PARK, 438 BUILDINGS)

ANNUAL KWH SAVINGS:

98.5 MILLION KWH; 1.4 MILLION THERMS

ANNUAL CO_2 SAVINGS:

77,247 METRIC TONS

ANNUAL ENERGY SAVINGS:

$8,000,000

Since the partnership between Arizona State University (ASU) and Ameresco began in 1999, Ameresco's responsibilities have included detailed facility and energy analyses, and the design and construction management of facility and infrastructure upgrades that have resulted in more than $8 million of annual savings over 21.7 million square feet of University infrastructure. ASU has saved 98.5 gigawatt hours of electricity and 1.4 million therms of natural gas, significantly reducing its annual energy usage and its carbon footprint by over 77,247 metric tons of CO_2 annually – equivalent to 23 percent of the University's total carbon footprint. As part of a broader commitment of attaining institutional sustainability and a University-wide goal of zero net greenhouse gas emissions, ASU selected Ameresco as its Strategic Business Partner to become climate neutral by 2025.

CASE STUDY

MEDICAL UNIVERSITY OF SOUTH CAROLINA, SC

TECHNOLOGY TYPE:

ENERGY SAVINGS PERFORMANCE CONTRACT, ENERGY EFFICIENCY, GUARANTEED ENERGY SAVINGS

PROJECT SIZE:

$16 MILLION

ANNUAL CO2 REDUCTION:

3,223 TONS

FACILITY SIZE:

3,000,000 SQ FT, 68 BUILDINGS

ANNUAL ENERGY SAVINGS:

$2,469,442

Facing a growing enrollment, diminished state budgets and aging infrastructure, MUSC partnered with Ameresco on a budget-neutral energy efficiency project that would be able to not only improve the learning environment, but improve both patient care and medical research facilities. Ameresco reviewed the major energy-consuming systems of the buildings to provide MUSC with a high-quality visual solution for the energy project. Ameresco was able to increase the energy infrastructure capacity for the growing campus, improve reliability and control, improve air quality and significantly cut energy and operational costs.

CASE STUDY

PORTSMOUTH NAVAL SHIPYARD, ME

TECHNOLOGY TYPE:

COMBINED HEAT AND POWER PLANT

ENERGY SAVINGS PERFORMANCE CONTRACT

OPERATIONS AND MAINTENANCE

MICROGRID FAST LOAD-SHED AND ENERGY STORAGE SYSTEM

FACILITY SIZE:

4 MILLION SQ FT

ESPC ENERGY PROJECT SIZE:

$44 MILLION; PLUS 3.6 MILLION DOD GRANT

CAPACITY:

10 MW WINTER; 5 MW SUMMER; 14 MW EMERGENCY

2016 ANNUAL SAVINGS:

$6,200,000

The U.S. Army Corps of Engineers and the U.S. Navy selected Ameresco to design and install three comprehensive energy conservation projects under an Energy Savings Performance Contract (ESPC), as well as a microgrid solution funded by a grant to demonstrate islanding capabilities which eliminates downtime during a loss of the electric public utility at Portsmouth Naval Shipyard in Kittery, Maine.

Improvements made to the Shipyard's various systems have allowed for the elimination of older equipment. With newly installed technologies and equipment, the Shipyard regularly saves on energy and has the ability to operate self-sufficiently if necessary.

CASE STUDY

MARINE CORPS RECRUIT DEPOT PARRIS ISLAND

TECHNOLOGY TYPE:

BATTERY ENERGY STORAGE SYSTEM

COMBINED HEAT AND POWER

MICROGRID CONTROL SYSTEM

SOLAR PHOTOVOLTAIC

FACILITY SIZE:

8,095 ACRES (OVER 3.9 MILLION SQ FT)

ESPC ENERGY PROJECT SIZE:

$91.1 MILLION

PV CAPACITY:

6.7 MW

ESPC ANNUAL ENERGY SAVINGS:

$6,000,000

The United States Marine Corps Recruit Depot Parris Island selected Ameresco in 2015 to deploy combined heat and power (CHP) and solar photovoltaic (PV) generation assets and to integrate them with a battery energy storage system (BESS) and a microgrid control system (MCS) capable of fast load shedding.

These improvements will result in 75% reduction in utility energy demand, 25% total water reduction, 10 MW onsite electrical generation, and combined annual carbon reduction of 37,165 metric tons of CO2.

THANK YOU

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