Tight Constraints and Big Results: Adelphi University Turns Asset Renewal into Opportunity

By Adam Schachner and Robert Shipley

To add resiliency and improvements to a small central plant without breaking the bank, Adelphi University leveraged guaranteed project outcomes to obtain a low-interest loan.

Adelphi University's heart is located 30 feet underground, in a 1920s-era boiler room where a new 1.99-MW cogeneration unit (combined heat and power, or CHP) takes in natural gas and emits electricity and heat. Rubber-coated wires and shining pipes dotted with valves and joints radiate from this boiler room, feeding the campus electrical network and the district heating system, and keeping the buildings alive, warm, and lit. New air-handling units (AHUs) spread air throughout the campus, regulating the climate of research laboratories and supplying oxygen to classrooms, so students remain alert through the challenge of a difficult exam or the marathon of a long day of classes.

What could be more beautiful than HVAC equipment?

But some would say that this equipment is best kept hidden. It's true that a facility maintenance manager might wish for above-ground equipment, piping, and valves that are easy to service and troubleshoot. But everyone else's vision usually involves singing birds, green grass and trees, and a peaceful campus not obscured by "unsightly" technology.

Adelphi University's campus is based on this second vision. Located in Garden City, Long Island, New York, it is bordered by a golf course on one side and surrounded by quiet residential neighborhoods. Enjoying green open spaces and outdoor sports fields, students typically use the grounds to relax, reading under trees, and others take their dogs for walks there. The university administration wished to maintain that aesthetic, keeping all the CHP in the underground boiler room.

THE PREQUEL

Before the new CHP and AHUs were installed, Adelphi's energy system had several shortcomings:

- On October 29, 2012, Hurricane Sandy tore its way through New York and New Jersey, causing injury, death, flooding, and property damage. It also took down the electrical grid, leaving Adelphi University without power for 36 hours and disrupting the class schedule for a week. It became clear that the university needed greater resiliency.
- Adelphi's central plant had old equipment that was in need of replacement. Two huge 60-year-old boilers and a smaller 40-year-old boiler provided hot water heating for the campus. These boilers were inefficient and reaching their end of life.
- The university wanted to bring the fume hoods and ventilation system in the science labs to the highest standard.

Replacing the old boilers with a CHP was the best option for adding greater resiliency. With the CHP and some pre-existing backup generators, the university's electrical needs could be entirely met, even in the event of another grid shutdown. A $2.2 million incentive from the New York State Energy Research and Development Authority (NYSERDA) for CHP installation made the choice even clearer.

OPTIONS AND GOALS

At first, Adelphi University contacted a large energy service company (ESCO) to discuss the project. The ESCO proposed that it would both pay for and manage the replacement of the equipment. However, for the next 15 years, the ESCO would also retain any utility bill savings that resulted from the project. Given the efficiency potential of replacing the three old boilers, this would equate to many millions of dollars. In addition,

the ESCO would receive any NYSERDA incentives.

Adelphi University decided to look for other options. They wanted to decouple the financing from project management, to find the best deal for both. They found two willing partners in First American and Ecosystem. First American would provide the financing, at a low interest rate, and Ecosystem would manage the project and guarantee the results.

Project outcomes and incentives were guaranteed: Project goals had to be met for a fixed total cost, with no change orders or extras.

The goals were ambitious:

- Eight-year payback on the project (compared to the original ESCO's proposed 15-year payback)
- 100% campus electrical resiliency
- Laboratory ventilation brought to the highest standard
- Equipment noise level kept to a minimum
- All equipment installed in the small (30 ft. × 60 ft.), underground boiler room

It was this last goal that would prove challenging.

The three old boilers had been built in place. They needed to be cut up and removed to make room for the new equipment. This had to be done on a tight schedule during the summer, in order to have the new equipment operational for the heating season.

Access to the boiler room was through a narrow ceiling hatch. Even after widening (which required the addition of support columns), the hatch measured no larger than 12 ft. × 17 ft., just enough for the 2-MW cogeneration unit to fit.

The boiler room is in the basement of Woodruff Hall, which houses sports facilities, offices, and classrooms. A soundproof enclosure needed to be constructed around the CHP so its noise would not disturb staff and students.

GETTING CREATIVE

There simply wasn't enough room on the boiler room floor for the addition of a CHP sound enclosure, AHUs, and two smaller, more efficient boilers. Luckily, the boiler room ceiling was quite high. The engineers got creative. An elevated mezzanine was installed, and the AHUs were mounted on it. This left enough room on the floor for the CHP and boilers.

By September 2016, the equipment was installed and running. Adelphi now has 100% electrical redundancy. The CHP's efficiency is 75%, significantly higher than the 60% required for the NYSERDA incentive, earning a $200,000 bonus incentive. The laboratories are modernized. The total project cost was $13.5 million, with annual energy bill savings of $1.6 million, matching the guarantee. Adelphi uses part of these savings to pay back their loan, while the rest is used to fund campus expansion projects.

Thanks to guaranteed outcomes, Adelphi was able replace aging equipment, address concerns with the energy system, and obtain a low-interest loan paid back through energy savings, to fund other infrastructure projects. This was all done while maintaining the peace and beauty of the campus.

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