Xavier University of Louisiana

The story of how one performance contract is improving university facilities beyond pre-Hurricane Katrina conditions.

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Equipment upgrades were needed and facility improvement projects were discussed. Then Hurricane Katrina hit and New Orleans-based Xavier University of Louisiana's needs suddenly grew exponentially.

Originally founded by Saint Katharine Drexel and the Sisters of the Blessed Sacrament in 1915 as a high school, Xavier University is a private institution and the country's only Catholic Historically Black College and University (HBCU). In 1925, a four-year college program was established and when the sisters transferred control over to a board of trustees in 1968, Dr. Norman C. Francis became president; he is still president today and is the longest tenured college president in the United States.

Almost 75 percent of Xavier University's 3,399 students are African American, although anyone is welcome to attend. The university offers preparation in 47 major areas at the undergraduate, graduate and professional degree levels.

Learning happens on the campus' 27 acres in approximately 20 buildings, totaling more than 3 million square feet of space. The university has a rich history, which its facilities reflect. The oldest campus buildings were built in the 1930s; the university's newest buildings are presently under constrction. The campus is constantly growing and renovation is ongoing.

In August 2005, when Hurricane Katrina hit the gulf coast, toxic flood waters inundated Xavier University. Every building but one – the Sisters of the Blessed Sacrament convent – sustained massive damage. Because New Orleans' levees were breached, the university had 12 feet of water on campus. Estimated construction-related damages from the flooding and high winds exceeded $75 million.

Xavier University was forced to close its doors for the fall 2005 semester. "Hurricane Katrina caused us to close our facilities for a number of months," says Marion Bracy, Vice President, Facilities Planning & Management, Xavier University. The university reopened its doors in January 2006.

Aside from the immediately recognizable destruction and disrepair, the school is still discovering latent damage, such as pipes rusting out, and dealing with government and insurance agencies more than six years later. As a result of Hurricane Katrina, however, maintenance that had been deferred for years was addressed and the university began thinking more seriously about increasing operating efficiency.

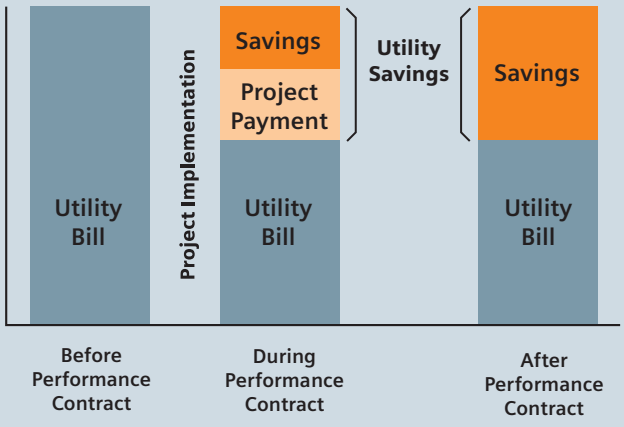
To truly reduce the campus' energy consumption and bring old systems up to date, the university would turn to its long-time trusted partner, the Building Technologies division of Siemens Industry, Inc.

Performance Contracting Defined

Performance contracting is a means of financing a multi-faceted capital improvement project. An energy services company (ESCO) identifies facility improvement measures (FIMs) that will reduce water, sewage, electricity, steam, natural gas, etc. and guarantees the predicted savings. The ESCO provides single-source accountability, acting as project manager, executing the work and/or hiring local contractors.

The contractee gets a loan to pay for the improvements. The cost of the project is divided by the guaranteed annual savings to determine the length of the contract. Project payment is based on the guaranteed annual savings. Once the project is implemented, the savings resulting from increased efficiencies are used to make loan payments to the capital leasing company. If the actual savings are in excess of the guaranteed savings, the contractee keeps the amount above the guarantee. If they are lower, the ESCO must pay the contractee the difference. Beyond the term of the contract, the contractee receives the entire energy savings.

How Performance Contracting Works



Conditions on Campus

By 2008, Xavier University was ready to explore ways to improve its campus and address problems from Hurricane Katrina that remained unresolved. Many of the buildings had aging infrastructure that was inefficient, unreliable and operationally intensive. "We were utilizing a lot more energy than we should have been," says Bracy of the institution's $2.5 million average annual electric bill. " We could not control the air quality in a number of buildings and were wasting a high level of water. Our lighting, although we were making some improvements, was a patchwork. We were also overworking our electrical system. We knew that we needed to do something, we just needed some guidance."

The university faced rising energy costs, growth and minor budget cuts. "The cost of operating was climbing constantly, and as we grew, we saw that our utility usage was rising. We had to find a way to maintain our standard of living and stay within budget," explains Sheppard Roubion, Director of Building Services, Xavier University.

Improvements that addressed deferred maintenance and inefficient equipment weren't the only facility projects desperately needed at Xavier University. The capacity of the chilled water plant was a problem after Hurricane Katrina. The hurricane caused damage to two chillers, leaving just one that remained functional. The university was in a vulnerable position, having no redundancy. The one operational chiller was being taxed to deliver enough water to meet all of the campus' needs. The university knew it had a pumping and control issue with its chilled water and needed a solution.

Additionally, some facilities were simply unable to provide an environment conducive to learning or the conditions demanded by staff and students. "We wanted to improve customer comfort and know that the person in room 15 was just as comfortable as the person in room one," says Bracy.

Performance Contracting

To complete an extensive facility improvement program, the university decided to enter into a performance contract by partnering with an energy services company (ESCO). This would be the first performance contract in Xavier University's more than 90-year history.

Performance contracting was advantageous for a number of reasons. First and foremost, the university could get a large volume of work done all at once, instead of making the improvements over many years as part of a long-term capital improvement program. And Xavier University could begin reaping the energy savings immediately. "We've been in on conversations and meetings with people about energy-saving concepts ... and we've done a lot in-house," says Bracy. "But this performance contract has really allowed us the opportunity to do a massive project."

Hiring an ESCO freed the university from the labor-intensive project management duties required for an improvement program of this magnitude. While the university's facilities team concentrated skills, effort and time on several capital construction projects, a trusted ESCO would be diligently completing numerous other facility improvement measures on campus.

Xavier University was contemplating a performance contract when Katrina hit, but immediately afterwards, the university had to focus solely on its recovery. "Right after Katrina, we just had to put everything on hold," says Bracy. Insurance and federal aid only provided funding to restore facilities to the condition they were in before the event. "An upgrade was no longer an option," he adds.

Three years after Hurricane Katrina, the university was serious about and ready to explore performance contracting. "It was all about timing for us. We had the opportunity and funding to move forward and we took advantage of it," says Bracy. "We had just come out of one of the biggest renovations in the history of the campus after Hurricane Katrina. We wanted to save money, but we also wanted to make sure that the savings would continue to work for us."

Selecting an ESCO

Before issuing an RFP for an energy performance contract, the facilities professionals at Xavier University sought advice from trusted industry sources. Three years ago, leaders of the facilities team began asking lots of questions to vendors, end users, fellow members of various industry associations and peers they met at national trade shows. "We'd talk to them and ask, 'what are you doing, what are you doing right, what have you done wrong and what are your experiences?' That's one of the great parts about establishing those relationships," says Bracy. "They can be truthful with us because they don't have any vested interest in us doing it or not doing it."

They asked peers in Kentucky, Arizona, Tennessee and Georgia about their experiences, hoping to apply the same best practices and avoid otherwise unknown pitfalls. From these conversations, the university developed key criteria

from which to evaluate ESCOs. More importantly, they recognized the need to partner with a company they could trust and professionals that would be there to answer questions during and after the projects were implemented.

As a result, when the RFP was issued and ESCOs responded, they were judged not only on the bottom-line savings guaranteed, but also on reputation and which company's capabilities would best fit the university's needs. Based on the knowledge they had gathered, criteria they set and past experiences, Xavier University selected Siemens.

The school has been a Siemens customer since 1980 and after 30 years of working together, a solid relationship and foundation of trust has been built. "Siemens established a good reputation on campus," says Bracy. In March 2010, Xavier University signed a 10-year, $4.3 million performance contract.

The Projects

Siemens' energy engineers performed an investment-grade energy audit of the campus facilities and generated a list of approximately 40 different facility improvement measures (FIMs) for Xavier University's review. Payback for these FIMs ranged from two to 50 years. With this list in hand, Siemens sat down with the university's facilities team to review the benefits and cost of each potential project. From this list, Xavier University chose five types of projects, which would make up the performance contract.

Lighting Upgrades
Not only was the lighting equipment in many of Xavier University's buildings inefficient, but its operation was just as wasteful. "Before this project started, you could drive by campus at night and it looked like a Christmas tree with so many different office and area lights on. Now that we have installed occupancy sensors, there's a vast improvement," says Roubion. "And that's a large reduction in energy use."

Approximately 70 occupancy sensors were installed under the performance contract, which will discontinue the practice of lighting unused rooms. "It's not enough just to say a person's going to walk out of a room and turn off a light, so we had sensors put in some of those rooms," says Bracy.

Lighting in 21 facilities has been improved by upgrading old inefficient technology to energy-saving lamps, fixtures and ballasts. Savings from the lighting projects alone are estimated to reduce Xavier University's annual kilowatt-hours by approximately 1,271,989.

Chilled Water System Optimization
With just one chiller functional after Hurricane Katrina hit, the university turned to Siemens to optimize the 2,400-ton capacity of its central chilled water plant, which serves over 14 buildings on campus.

At the cornerstone of Xavier University's facility improvement program was Demand Flow™, a proven Siemens patent-pending technology that optimizes central chilled water systems to reduce the plant's total energy consumption by 20 to 50 percent. This chiller plant optimization solution increases the deliverable tonnage of the chilled water plant and simplifies operations, without sacrificing occupant comfort. Demand Flow will cut Xavier University's annual energy consumption by 2,299,447 kWh annually.

Physical upgrades, repairs and additional mechanical installations have been implemented, including new variable frequency drives (VFDs) on all chilled water pumps, chilled water temperature and flow sensors in multiple buildings and two-way chilled water control valves on air-handling units.

Energy Management and Control Systems
To increase energy efficiency and give Xavier University greater control over building systems, Siemens enhanced the APOGEE® Building Automation System to perform the time-of-day scheduling function. Time of day (TOD) scheduling allows the building automation system to start and stop HVAC equipment at a specific time, instead of letting it run 24 hours.

Impact of Facility Improvement Measures

Lighting Upgrades	Chilled Water Optimization	Mechanical System Improvements	Water Conservation
21 facilities provided lighting improvements	**20–50% reduction** in central plant energy consumption	**314,604 kWh** of annual electricity savings	**16,000 therms** in reduction of domestic hot water
1,271,989 kWh of annual energy savings	**2,299,447 kWh** of annual energy savings	**437 ccf** in estimated annual gas savings	**16% reduction** in annual water usage

Enhancements to the system have also enabled Xavier University to implement Demand Control Ventilation (DCV). Whenever possible, the systems in these buildings now provide functional control of air-handling units in order to provide an optimal level of outside air ventilation based upon room occupancy. "Being in the deep south, we have a serious heat and humidity issue. Demand ventilation will actually provide a more healthy environment for the occupants based on CO_2 discharge," explains Roubion.

Implementation of TOD scheduling and DCV has taken place in a total of 15 facilities on campus. Xavier University's existing system has been upgraded with the latest Siemens APOGEE Insight and training is being provided to ensure proficient operation of the system by the staff at the university.

Mechanical System Improvements
Multiple improvements have been made to Xavier University's mechanical systems in an effort to streamline operations and reduce dependency on utilities. Siemens has re-insulated sections of chilled water, dual temperature and heating hot water piping where insulation was missing or badly damaged. The repair or replacement of worn out or damaged piping insulation has improved operating efficiency. "The piping insulation projects worked out well for us," explains Bracy. The mechanical pipe insulation improvements will save the university an estimated 314,604 kWh of electricity and 437 ccf in estimated gas savings each year. Piping insulation repair took place in 14 buildings.

Six new motorized valves have been added to the dual-temperature piping entrance near three buildings (i.e., the Gymnasium, Katharine Drexel Residence Hall and St. Michael's Residence Hall) to automatically isolate the building piping from the central energy plant during heating-cooling switchover. "That's going to help us with a few of the older buildings, where there is what's called a two-pipe system. Otherwise, we have to physically switch those over between times of year that require cooling and heating," says Roubion.

Air distribution modifications, including the addition of variable speed drives on electric motors, have been made to existing ductwork, distribution boxes and grilles to optimize energy efficiency and occupant comfort in the College of Pharmacy.

Water Conservation
Water conservation projects included replacing wall-mounted and floor-mounted toilets with low-water usage devices and installing aerators on lavatory faucets to reduce flow, yet still provide the necessary service needed to wash hands. In some areas, pedal valves (e.g., kitchen areas) were installed on wash sinks.

Siemens has installed either water use or cost-reduction devices and/or new plumbing fixtures in 26 facilities to reduce the more than 22 million gallons of water used annually by the institution to 18.4 million gallons per year. Additionally, the BTUs of annual domestic hot water will be reduced from 1,645 MMBTUs (about 16,000 therms).

"Many of these are things that we had on our list to do but just didn't have the funds to do," says Bracy. The performance contract provided both the opportunity and the financing means to address known and unknown inefficiencies and problems.

Construction

"We had agreements to sign contracts and they actually asked us to get started over the holidays while the kids were away from campus," says John Agnelly, account executive, Siemens. "So we started part of the project on just a handshake." With the lighting retrofit already partially completed, the construction formally began in March 2010 and was completed over the following 12 months. Siemens either performed the work using its technicians and engineers, or acted as general contractor and hired local subcontractors who implemented the FIMs. Executing some of the projects proved challenging. Several of the campus' older buildings required work to be performed in such a way to preserve the historic integrity of the facilities. During a construction project in an older building, especially historic buildings, to make discoveries not previously uncovered in a preliminary study is common; such was the case at Xavier University. "Over the years, as the old buildings were modified, some things were left by the wayside and then it was rediscovered and put back into service," says Roubion of some surprising HVAC discoveries.

Additionally, finding time to complete the work when it would cause minimal disruption was critical. "On a college campus, scheduling is always a problem," says Bracy. The work had to be performed in as least disruptive a means as possible. "There are a number of people around campus right now that cannot tell you how much we've actually done because [Siemens has] worked nights, weekends and off-times," he says. "Our customers are going along with their day-to-day activities not knowing that we have a major undertaking that's happening right underneath them. To me, that's worth its weight in gold."

As soon as construction was completed, the measurement and verification phase began. Some of the savings (e.g. lighting) will be verified using pre- and post-measurement

data. However, the chilled water savings validation is based on continuous dynamic measurement. Siemens monitored all of Xavier University's chillers and pumps to establish how much energy they were previously using to deliver chilled water, and is now determining how much chilled water tonnage is currently being delivered; a daily calculation will be applied to show the ton-hours used and how efficiently they are being delivered.

Previously, Xavier University had only one meter for the entire campus. "The problem that we've had," explains Bracy, "is that as we're doing some improvement, there was no way, other than looking at a monthly bill, of actually measuring the savings. Now we have meters around so we have the ability to measure it a lot better." Whereas Xavier University didn't have a precise way to validate the savings resulting from its previous projects, this performance contract has now provided greater measurement capabilities.

The Benefits

The work performed under the performance contract will dramatically cut the university's utility expenses. "Ultimately, we wanted to be known as an energy-efficient campus," says Bracy. Thanks to the projects completed under this agreement, Xavier University has achieved that status. Siemens is guaranteeing annual savings of $553,213, of which $472,516 is due to the reduction in energy use. "Now we're not just saying that we're saving money, but we can show people how we're saving it and how we've been utilizing energy," says Bracy.

Not only will the university use less energy, but it will be easier and less costly for in-house staff to maintain campus buildings. New occupancy sensors mean that people will no longer have to turn lights off manually and because lamps won't be running as long, relamping will not be as frequent, saving money and staff time. Standardizing on lamps and other fixtures will also keep costs down.

Improved control and operation of HVAC equipment has already proven beneficial. "The number of hot/cold calls has already gone down drastically," noted Bracy soon after the project's completion. Additionally, remote monitoring and control of building systems will prevent technicians from performing manual onsite operations, freeing up their time to do more valuable tasks. Operations and maintenance-related savings, not all of which are included in Siemens' guarantee, total $150,000 per year.

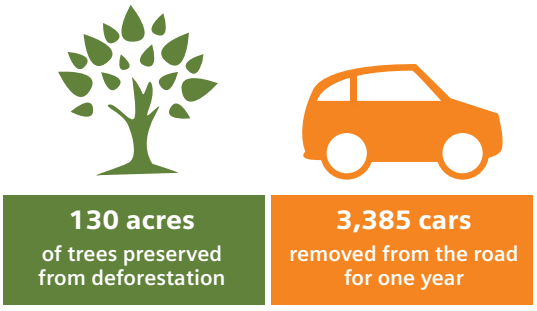
Students, staff, faculty and visitors are more comfortable in campus facilities now. Demand ventilation will ensure that the required amount of outdoor air is being brought into buildings and that CO_2 levels are maintained properly. Lighting is easier on the eyes now too.

"The lighting contractor measured all the lighting at the desk level to make sure it's meeting the lighting standards and guidelines for classroom environments," says Agnelly.

Healthier indoor air quality and improved lighting make a noticeable difference. "Our main goal is to provide education to young people. If the environment is uncomfortable, it distracts them from learning," says Roubion. "The goal is to give them a safe, healthy, comfortable environment so they can concentrate on making the grade."

The facility improvement projects also demonstrate Xavier University's commitment to the environment. "A number of younger people as they come into the university were asking, 'what are we doing to conserve energy and better utilize whatever energy sources we have coming into the campus?'" says Bracy. "Even their concern created an awareness."

Environmental Impact of Campus Improvements



By executing these FIMs, Xavier University, over the full term of the performance contract, will reduce the amount of CO2 emissions (the result of saving electricity and natural gas) equivalent to:

- 130 acres of forest preserved from deforestation.
- 97 railcars of coal not burned.
- 3,385 cars removed from the road for a year.

Other emissions are being cut as well. Nitrogen oxide (NOx) emissions will be reduced by 6,695 pounds annually and the sulfur dioxide (SO_2) emissions reduction totals 6,896 pounds each year.

The performance contract between Siemens and Xavier University has been a resounding success. Facilities are easier to operate, more efficient and provide a better learning environment for students. Construction happened with minimal inconvenience and disruption. "Siemens' workers were very polite, very efficient, and everything went as well as we expected," says Roubion. "This was a well-run project."

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