Frances Anne Moody Hall at Southern Methodist University, above. Left, project leaders on recent energy initiatives at the campus in Dallas, left to right, Gary Dunker, Siemens account executive; Chris Regis, SMU senior vice president and CFO; Jason Haddock, Siemens area success manager; David Fuqua, Siemens/SMU energy program manager; Michael Molina, SMU vice president of facilities and chief architect.

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Pioneering a 'smart' campus at SMU

Infrastructure modernization, better energy management and data-driven maintenance

By Michael Molina and David Fuqua

A broad energy modernization program started at Southern Methodist University in 2017 has established a foundation for long-term efficiency, optimal performance, lower costs and greater reliability.

A comprehensive facility assessment completed eight years ago at the university revealed several challenges: escalating energy costs, aging mechanical systems and a reactive approach to systems maintenance. Since then, SMU, working closely with Siemens, has realized $2 million in annual energy savings while delivering building performance commensurate with top-tier energy management programs.

Combining new development initiatives with conversion of existing facilities.

Under the direction of the SMU facilities team, Siemens helped create a campus energy and modernization road map that began with planning, prioritization and investment in campus infrastructure. It included development of a utility management strategy to help ensure continuous optimization and enduring value.

The campus, in Dallas, encompasses 234 acres, more than 100 buildings and 7.5 million square feet of building space. The university has 12,000 students.

The campus central plant was critical to transition. Its makeover includes

12,000 tons of new chilling capacity, boilers, pumping systems, electrical systems, cooling towers, air handlers, fire systems and a Siemens Desigo control system. Recommissioning was accomplished while maintaining utility delivery by procuring and managing temporary chillers in an adjacent parking lot. Overall, the project brought over 70 campus buildings up to performance and maintainable standards.

Further upgrades of campuswide utlities distribution systems continue, including to chilled water, steam, condensate return, conduit, and data cabling systems that are routed through three miles of tunnels.

Meanwhile, an aggressive utility management program makes the most of natural gas and electricity procurement and a price-hedging program to mitigate market volatility and reduce costs. This program has contributed greatly to savings and budget stability in the volatile power market regulated by ERCOT, the Electricity Reliability Council of Texas.

THE THREE PILLARS OF INSTITUTIONAL TRANSITION

Three pillars have supported the transition: infrastructure modernization, campus energy management and data-driven maintenance.

Where utility costs once totaled $2.19 per square foot, they are now $1.87.

Infrastructure modernization: From the beginning, SMU has modernized campus building control systems and installed extensive monitoring and metering to support advanced automation and digitalization.
Part of the work involved Siemens implementing its Desigo standardized sequences of operations for all building and mechanical components and completing building and central utility plant upgrades. These included the replacement of air-handling units, aging chillers and other mechanical and electrical equipment; implementing its branded Demand Flow technology for chilled water (resulting in chilled water performance of 0.46 kW/ton, down from over 1.0 kW/ton); and installation of variable frequency drives, or VFDs.

Campus energy management: SMU's campus energy management platform provides secure, remote and cloud-based performance monitoring and analytics, offering transparency into building and utility systems performance and supporting planning, prioritization of investments, and continuous optimization. This practice, coupled with a strategic energy supply procurement and hedging program managed by Siemens, helps SMU make informed decisions about natural gas and electricity purchases based on the outlook for demand, price, market and budget. Through strategic energy supply management, SMU has avoided millions of dollars in energy costs since 2017, protecting it from market price spikes and providing cost predictability and budget stability.

Data-driven maintenance: SMU has also laid the foundation to function as a "smart" campus by capturing and analyzing data in real-time, turning to a Siemens fault detection, diagnostics and remote services program integrated with work-order management and maintenance. Advanced analytics and automation at SMU mean most alarms and faults are addressed remotely. By

An overview of the 234-acre campus, above. Gridiron action at Gerald J. Ford Stadium, right.

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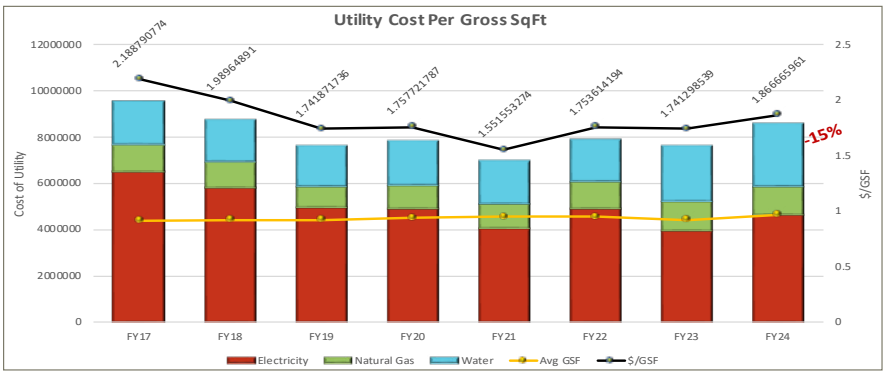
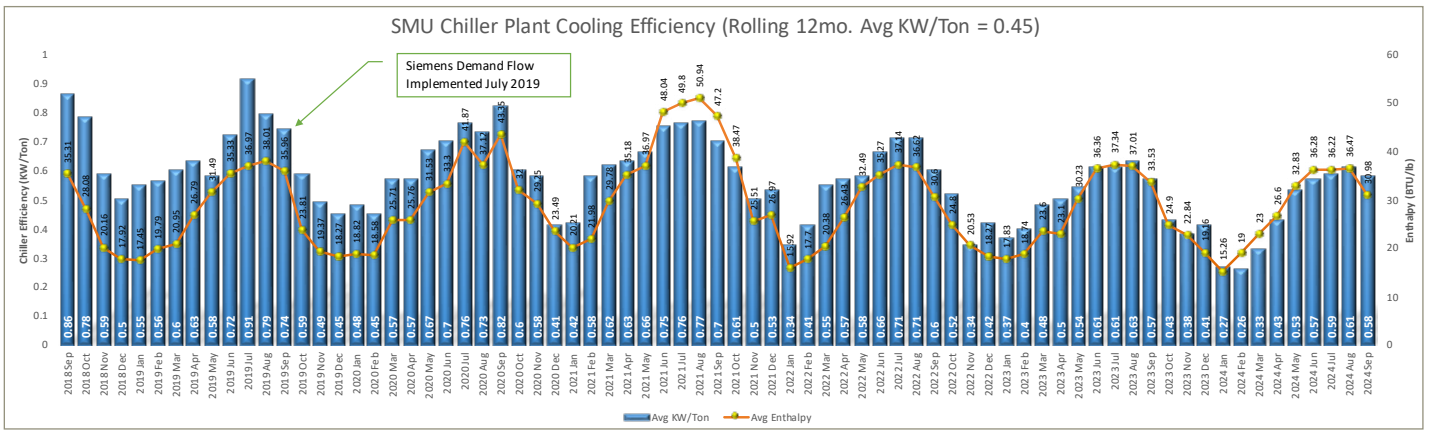


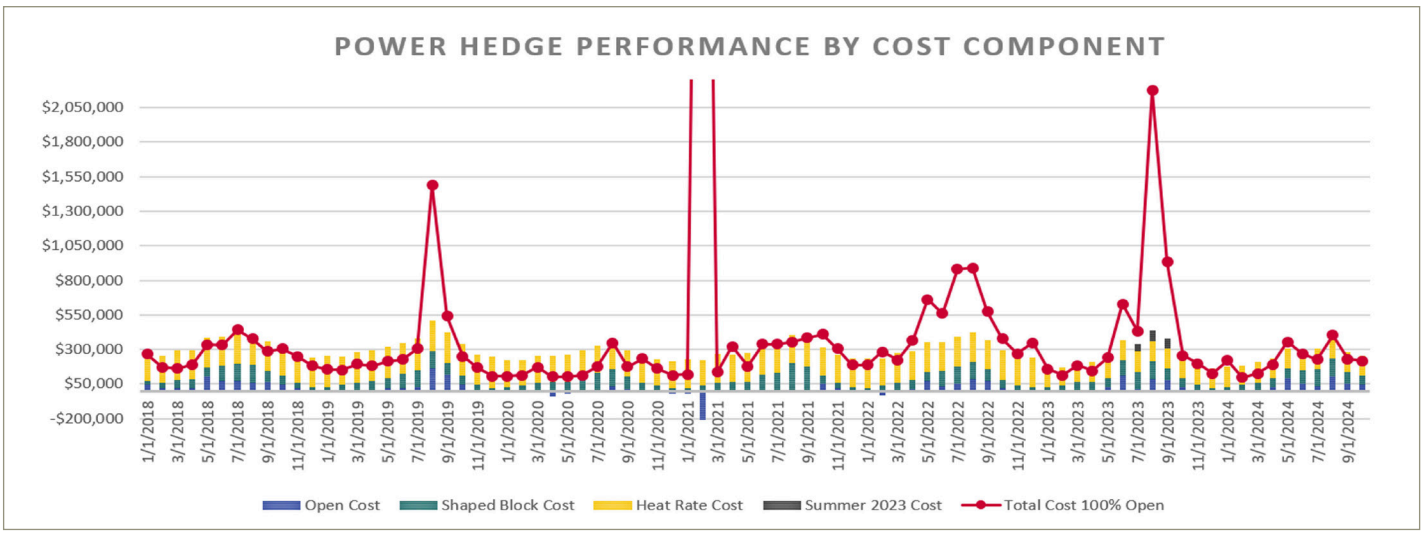
Top: Even after the addition of 660,000 square feet of new facility space and a 21% increase in enrollment, SMU has seen its total utility cost per square foot fall by 15%.

Middle: Siemens' Demand Flow chilled water plant optimization uses machine learning to deliver improvements in energy efficiency as well as less operational risk and equipment maintenance.

Bottom: SMU's natural gas and electricity hedging program protect the university against price volatility and disruptive weather events.

Siemens





identifying potential issues before they compound and then providing recommended actions and priorities, the program enables proactive maintenance that helps extend equipment life and greatly improves labor efficiency. The campus reports a 26% increase in maintenance staff productivity by shifting from reactive to predictive work. Integrating workflows between remote and dedicated on-site technical support has led to improved building performance, operational reliability and significant energy savings.

RICH DATA STREAMS THAT INFORM PROGRAM SUCCESS

Every 15 minutes, data is collected from more than 65,000 points across campus, generating tremendous amounts of information for the campus facilities team. Combining data-driven key performance indicators, or KPIs, with performance monitoring and other metrics has helped identify buildings that are efficiency outliers and make informed decisions regarding energy usage, optimization and return on investment.

Likewise, SMU now has full transparency into the performance of its more than 25,000 equipment components across campus, enabling efficient technician support and ultimately driving continuously optimized operations and resource utilization.

Since 2017, the university has saved more than 33 million kilowatt-hours of electricity, translating into a 15% reduction in utility cost per square foot during a time when the student population grew by 21% and facility space expanded by 660,000 square feet. Where campuswide utility costs once totaled $2.19 per square foot, they are now $1.87.

These energy savings, with associated water reduction, have also reduced the campus's environmental impact. Systematic investments in facilities upgrades, energy efficiency and water conservation measures have also led to improvements in building performance, energy savings and reliability.

Proactive facilities management offers specific additional benefits. During the record cold winter of 2021, SMU's energy supply contracts helped ensure that the institution fared far better than others in the region that endured outages and huge electric bills. Today, this program continues to deliver cost predictability and budget stability in an area of the country where price volatility and brownouts are common.

By harnessing the power of data and digitalization and integrating them into well-planned workflows, SMU has become a high-performing campus with streamlined maintenance, a sustainable financial model and impressive results by way of energy and operational savings.

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A $32 million contract combines the effects of infrastructure and efficiency upgrades

How the University of Florida approached campus energy modernization

An aging steam line at the University of Florida around Holland Hall prompted a broad district energy infrastructure review and led to a new district hot water system retrofit using high-efficiency condensing boilers.

The project was also expanded to include building automation, lighting, chiller plant renovation and optimization, plus an onsite battery storage system with solar, EV charging and microgrid controls for additional resilience and cost savings. The combined approach generated approximately $8 million to $10 million in construction cost savings, and is projected to produce more than $5.2 million in energy savings over two decades.

The university engaged Siemens on a 20-year, $32 million performance contract to implement the more efficient, decentralized approach. The primary component, replacement of the Holland district's existing underground steam infrastructure with underground hot water pipes and a localized condensing boiler plant, was centered within an existing chilled water plant.

In addition to dollar-cost savings, transitioning to a hot water-based system using condensing boilers also allowed the university to achieve higher efficiency. The new boilers operate at more than 95% efficiency compared with the 70% efficiency of the old steam infrastructure.

During construction, UF and Siemens also did a complete renovation of the interior space, making room for the new system, allowing for consolidation of equipment in the cooling tower yard and creating space for a 1-MW battery storage system. This system, currently in pilot phase, provides load shedding for energy savings and enables limited islanding to support critical infrastructure during power outages.

The project includes a new solar canopy over existing exterior parking spaces, with EV charging stations, that provides additional power to the district electrical system while creating shaded parking places, a feature UF anticipates monetizing. A Siemens Xcelerator project integrates the microgrid controls, solar PV, switchgear and multiple building automation systems to enhance UF's ability to optimize energy, curtail load and provide for district energy resilience.

This infrastructure renewal project, combined with an array of other building and utility improvements within the performance contract scope, also includes building automation, LED lighting, energy and water conservation technology, Siemens' Demand Flow chiller plant optimization, and space utilization guidance via the Siemens Enlighted platform. Combined project effects also mean millions of dollars in infrastructure renewal cost avoidance.

The project as a whole showcases how universities can adopt an innovative, integrated approach to reducing energy consumption and operational costs, and renewing critical infrastructure while supporting sustainability objectives.