Return on Investment: A Pennsylvania Credit Union Capitalizes on Reliable Power

By Carol Brzozowski
Published: Forester Media (https://www.foresternetwork.com/distributed-energy/article/21092278/return-on-investment)
Monday, August 26, 2019

Mobile and online banking services are increasing in popularity in response to demand by consumers — particularly millennials — who seek more convenient options for managing their money. As such, there is a significant need for power resiliency at financial services' data centers to keep business exchanges going without a hiccup.

With multiple studies revealing billions of dollars in financial losses to the US economy due to the aftermath of power outages, the financial sector is particularly vulnerable to the loss of consumer confidence and employee productivity when systems go down.

Facility operators at PSECU, Pennsylvania's largest credit union, were keenly aware of that and sought to mitigate potential downtime at its 239,000-square-foot headquarters and data center located on 47 acres in Harrisburg. They also sought to create a more environmentally efficient operation with the measures they've instituted leading to the facility's LEED Gold certification.

While the credit union's data center location in Pennsylvania is fairly protected from weather disasters, heavy thunderstorms can move through the area with strong wind gusts that can bring down power lines, points out Pete Spicher, PSECU's facilities manager.

In April 2014 after building its new headquarters and after consultation with UGI Performance Solutions — which has a partnership with E-Finity Distributed Generation, the Capstone Turbine distributor — PSECU selected Capstone's air-bearing, high-pressure, natural gas-powered microturbine power generation technology for its combined cooling, heating, and power (CCHP) application.

The tri-generation installation includes the Capstone C800 Power Package, 3-million-BTU heat exchanger and a 250-ton, flue-gas fired absorption chiller, as well as a mTIM PLC Control System from E-Finity.

The member-owned, not-for-profit PSECU was started in 1934 by 22 state employees who pooled $90 and has grown to become the state's largest credit union by membership and asset size, with 450,000 members and $5.4 billion in assets.

"PSECU's model is branchless and cashless banking, and because of that, the vast majority of our transactions are either internet-based on our website or through our onsite call center," notes Spicher.

"As a result, we are largely dependent on our network infrastructure and our data centers. That was one of the primary factors we looked at when we considered the CCHP plant for our environment here at our new headquarters building," he adds. "The CCHP plant contributes to our backup power systems in making sure that our data center cannot go down at any given time."

Capstone Turbine offers clean, stable power during a utility outage and its systems can be sized for N1 and N2 redundancy, providing a highly reliable, resilient onsite power plant, notes Jeff Beiter, managing partner at E-Finity.

Conventional methods would include use of diesel generators as a primary source of electric backup, Spicher points out. He notes that while PSECU has one diesel generator supporting its data center, diesel-fueled generators would require onsite fuel storage so the data center at PSECU's headquarters relies on its CCHP plant — which is powered by the natural gas-fueled microturbines — as the primary backup for its data center.

Because the turbines are powered by natural gas and PSECU effectively has an unlimited supply, the facility can run 24/7 as long as there is natural gas service, notes Spicher.

As a whole, the state of Pennsylvania plays a strong role in energy production due to the abundant gas flow from the Marcellus Shale and it is projected to grow to 5 GW in total capacity within the next 10 years.

The turbines offer a multitude of benefits. "These are little single-stage jet engines that are extremely quiet and are lubricated with the air you are breathing," says Beiter. "They have emissions that are 10 times cleaner than car emissions."

Spicher adds that the microturbines "run at a high RPM as they spin on a cushion of air. There is very little friction and

wear on the parts compared to a conventional combustion engine. The longevity of it was attractive."

Spicher notes that PSECU has a 3-million-BTU heat exchanger. "Essentially, the system was originally installed to be set up to run heat mode or cool mode off of the captured exhaust," he explains. "The captured heat exhaust from the turbines is routed into an adjacent maintenance building and either passes through a heat exchanger to provide heat or to an absorption chiller to provide cooling to our building."

About a year and a half ago, facility operators modified that to allow a dual-mode function, enabling it to communicate with and work independently from the local utility grid to maximize efficiency.

Spicher says that has further increased efficiencies "whereby in our transitional seasons of spring and fall when our cooling load and our heating load is lower, we can actually heat and cool at the same time.

"That eliminated our normal hot water boilers from firing at all during spring and fall months," he adds. "That was another savings for us as it relates to natural gas that we would only be burning for our hot water boilers."

Capstone's CCHP system powers 100 percent of the facility during the colder months and 60 to 70 percent during the warmer months while providing the ability to send a surplus of clean electricity back to the grid during non-peak hours, says Spicher.

For the most part, the system heats the building in the winter months with the 3-million-BTU heat exchanger and in the summer months provides 250 tons of cooling to the building, he says.

"We use that chiller as our baseload chiller during the summer months, which overall provides major energy savings for our facility," he adds. "During the utility outage, the system simultaneously provides electricity, hot water and chilled water to the data center, and clean onsite combined heating, cooling and power when and where needed."

Additionally, Spicher and his team were impressed that the Capstone Turbine C800 Power Package can produce up to 800 kW of power at any given time through four individual 200 kW turbines that run in parallel with each other as well as the PPL power grid. Ready for a potential increase in power demand, the system was installed using five-bay enclosure, thus allowing increased power output to 1,000 kW without the need for more onsite space or lengthy construction schedules.

"The nice factor about this setup is that you have four separate engines providing power to the overall unit and therefore you can take one engine down at a time for service or repairs without interrupting the total output on the overall unit," says Spicher.

One of the components making those efficiencies possible is the E-Finity PLC-based mTIM control system with remote monitoring. The system exchanges key energy production data between the installed Capstone power plant and PSECU's building automation system to maximize thermal priority performance monitors, perform diagnoses and troubleshoot the Capstone system 24/7. This enables E-Finity's customer service department to fix the unit remotely, minimizing downtime and maximizing uptime for PSECU.

Energy and performance data also are made available to PSECU staff in real time. "They know as soon as we know when there's an issue and can dispatch technicians for repairs before we even report it to them," says Spicher.

Before start-up E-Finity's application engineering team works to optimize system sizing and provide integration and controls support that results in equipment peak performance. "After start-up, E-Finity's service team methodically monitors hundreds of data points 24 hours a day," says Beiter. "This remote monitoring feeds any and all system alarms — both performance notification as well as system faults — to a team of dedicated service technicians who log into the system and remotely troubleshoot and repair the fault or dispatch to the site and already know where the repair needs to be made."

In the five years since the Capstone Turbine system was commissioned at PSECU, the system has provided more than 182,309 cumulative run hours with all four turbines running nonstop, says Spicher.

Significant energy efficiencies have been the biggest return on investment, he notes. "While power redundancy was a driving factor in our decision to use this, what put this over the top for us is the return on investment," he adds. "The original calculation was a 5.6-year return on investment. We put out about $3.2 million for this overall plant and the idea of having that return to us and put the rest of the savings in our pocket for the remaining lifespan of this system was very attractive."

Three years into running the plant, Spicher and his team calculated the actual costs to date to discover the facility was on track for a 5.5-year payback as opposed to a 5.6-year payback.

"We were actually doing better than was originally predicted," he adds of the ROI.

The system's reduction of carbon emissions by 1,468 tons per year is another favorable factor, says Spicher, adding that facility managers have noted a 30 percent gain in efficiency over the five years of operation, equivalent to the annual electricity consumption of 1,355 homes.