A Caterpillar® publication for Power Professionals SUMMER 2019

RUNREADY™

10 YEARS OF RUNREADY 2010-2019

SUSTAINED EFFORT

Campus district energy system reduces GHGs and increases efficiency

OFF THE GRID

Fort Knox a model for energy resiliency

GEARING UP

Data center ensures uptime with Cat® Switchgear upgrade

Cairns Complex, Brock University

Louisiana CAT®

To a Sustainable Future

In this issue, we profile a public university in the Niagara region of Canada that's ahead of the curve when it comes to utilizing district energy and promoting sustainability.

Since 1994, a 6.4 MW power plant has been providing nearly all of Brock University's energy needs. Recently, the school upgraded the plant to 8 MW with the installation of four Cat® G3516H gas generator sets, which are more efficient and greatly reduce GHG emissions. The new power plant puts the university on track to reduce emissions 20 percent over a 10-year period by 2023.

Keeping switchgear up to date is often overlooked when it comes to maintaining an onsite power system. Read about how one Cat dealer, backed by expert factory support, helped a Kansas data center upgrade its switchgear and maintain 100 percent uptime for its customer base.

Also in this issue, the U.S. Army is working to move beyond energy and water projects that just increase generation options, or save money, to projects that incorporate resilience—including microgrids and combined heat and power systems. Last fall, engineers at the Fort Knox military base in Kentucky conducted an energy resilience test by cutting off grid power and operating the base on its own energy resources, something no other Army base has tried—and it worked.

Not only did Fort Knox pass the test, but its Cat powered cogeneration system saves the base $5.5 to $6 million annually in energy costs—proving that cogeneration is indeed Army strong.

We invite readers to contact us and share their success stories with Cat power systems installations.

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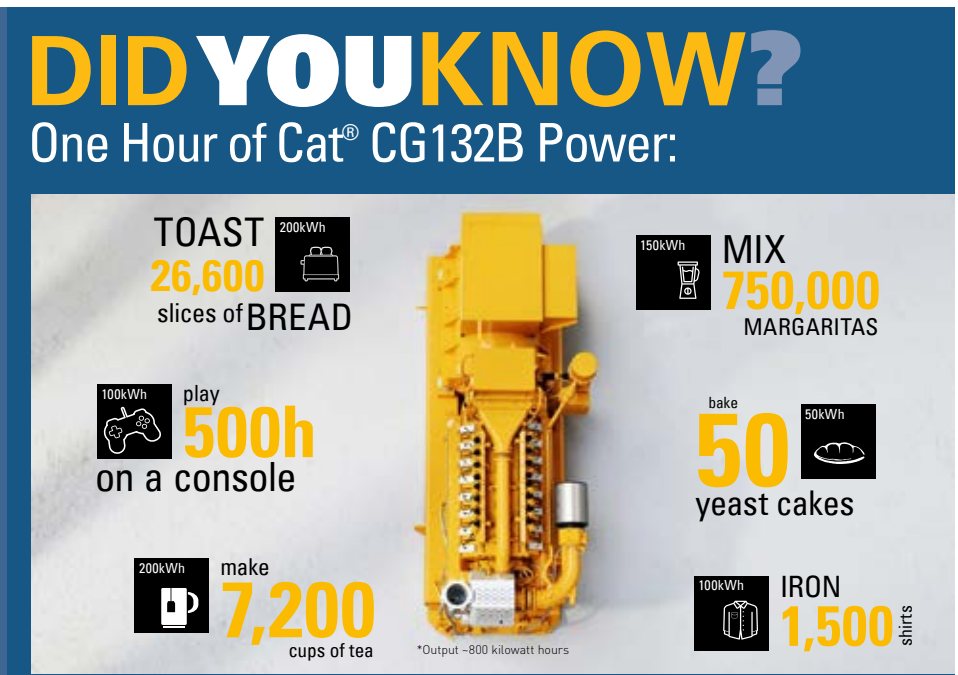
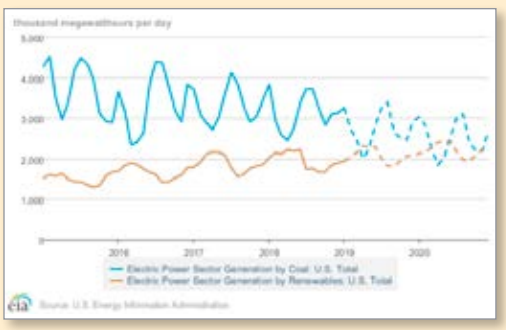


GAS AND RENEWABLES ON THE RISE

For the first time ever, the renewable energy sector (hydro, biomass, wind, solar and geothermal) was projected to generate more electricity in April than coal-fired plants, which totals about 240 gigawatts (GW) of still-operating capacity. According to data published in the Energy Information Administration (EIA) Short-Term Energy Outlook, renewables may trump coal through the month of May as well.

The estimates in the EIA outlook show renewable energy generating 2,322 and 2,271 thousand megawatt-hours per day (MWh/day) in April and May, respectively. This would top coal's expected output of 1,997 and 2,239 thousand MWh/day during the same two months. The EIA sees renewable generation topping coal-fired output sporadically this year, and again in 2020.



This represents a momentous development driven by the deep transition underway in the electric generation arena. It is also likely, particularly given Institute for Energy Economics & Financial Analysis' (IEEFA) forecasts for continued declines in the amount of installed coal-fired capacity, and steady increases in the amount of installed solar and wind generation, that renewable output will begin outpacing coal more and more frequently—just as occurred with natural gas.

The first instance of natural gas-fired generation exceeding coal's output happened not so long ago, in April 2015.

The final monthly crossover point occurred in January 2018, and natural gas has held the uncontested top spot in electricity generation ever since. On an annual basis, the two fuels each accounted for about 33% of the electricity market in 2015; since then, their trajectories have taken different paths. By 2018, natural gas's share had climbed to 35% while coal's had dropped to 27%. The trends for both are expected to continue.

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Brock University put itself on a path to energy independence 25 years ago by establishing a district energy plant that supplied 85 percent of the campus' energy needs. Recently, the university in the Niagara region of Canada upgraded its plant with four Cat® G3516H generator sets that increase efficiency.

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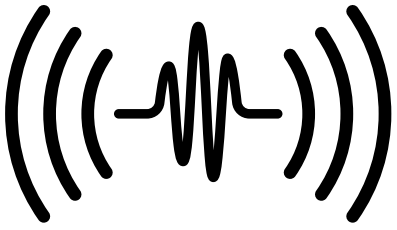

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10 YEARS OF RUNREADY 2010-2019

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SUSTAINED EFFORT

NEW CAT® POWER PLANT BUILDS ON PAST

When Brock University unveiled the new home of its Environmental Research Sustainability Centre in a restored 19th-century farm cottage last year, it furthered efforts to produce world-class research and educate students in environmental sustainability.

But 25 years ago, well before the sustainability movement gained traction, the public university in St. Catharines, Ontario commissioned a 6.4 MW district energy plant. The impetus for Brock to produce its own energy was the rising cost of power from the electric grid—a trend that has continued unabated since the plant began operating in 1994.

The power plant was recently updated with the installation of four Cat® G3516H gas generator sets that produce 8 MW of electric power for the main campus. For every kilowatt of electricity produced, approximately one kilowatt of heat is also recovered. The heat recovered from the cogeneration engines is used in the campus' hot water district energy system. This energy-efficient system is the main source for heating and cooling the main campus.

"The original plant was designed as the university's primary heat source with a byproduct of electricity. This worked well for almost three

decades," says Scott Johnstone, Brock's associate vice president of facilities management. "We refer to it as an energy multiplier, producing heating, cooling and electricity, all from one fuel source."

Brock's district energy system also incorporates a 400,000-gallon (U.S.) thermal energy storage tank, which acts as a battery, storing hot or chilled water depending on the season. This stored energy is discharged as needed, eliminating the need for additional heating and cooling equipment.

According to the U.S. Energy Information Administration, most electricity that comes from the grid is derived from coal, nuclear power and natural gas, and by the time the power reaches its intended destination, the efficiency rating dwindles to around 40 percent or less.

"In Ontario, electricity is not commonly produced close to the actual user, making it very difficult to use any of its waste heat," says Drew Cullen, district energy manager. "However, with distributed generation, you can capture all the energy released and transform it to increase your plant's efficiency. This results in economies of scale and cost savings."

Continued on page 6

CUSTOMER PROFILE

Brock University

Location: St. Catharines, Ontario, Canada

Application: District energy (heating and cooling)

Cat® Equipment: G3516A gas generator sets (8), replaced by four G3516H gas gensets

Plant upgrade

Last summer, Brock began replacing the eight old Cat 3516A workhorse engines with four Cat 3516H engines, which produce 2 MW of electricity each. Brock will also derive an additional 6 million BTUs from the engines, while lowering the plant's consumption of water and natural gas—all of which will significantly reduce the plant's carbon footprint.

While the former plant produced 85 percent of Brock's energy needs, the new configuration provides 100 percent of the current campus energy demand. In addition, the new plant is 20 percent more efficient, reducing nitrogen oxide emissions by 95 percent and carbon monoxide by 93 percent on a per kilowatt basis.

The increased efficiency of the new G3516H generator sets will go a long way in helping Brock meet its goal of a 20 percent reduction in greenhouse gas emissions by 2023.

The first phase of the project was funded in part by the federal government's Strategic Investment Fund (SIF) and the province's Facilities Renewal Program (FRP). The second phase was completely funded by Ontario's Greenhouse Gas Campus Retrofit Program (GGCRP), which provided $85.2 million to eight Ontario universities through its innovation grant fund.

"What's unprecedented for Brock with this project is that it's 100 percent funded by government," said Brian Hutchings, the university's vice president of administration. "The upgrades will result in utility cost savings, which will allow us to keep those costs flat during a period of inflation."

Jim Bradley, a former Member of Provincial Parliament and Ontario cabinet minister, said the province and Brock University share a common goal: carbon reduction.

"This investment by the Ontario government reaffirms its commitment to reducing greenhouse gas emissions on university campuses," said Bradley, who is now Chair of the Regional Municipality of Niagara. "This will allow the province of Ontario and its post-secondary institutions to lead by example when it comes to being energy efficient."

Peripheral benefits

Another important advantage of having a cogeneration plant is maintaining a reliable energy supply and campus resiliency in the face of power outages or severe weather.

"Many campuses have been considering cogeneration as a climate change adaptation tool," says Mary Quintana, the university's director of asset management & utilities. "That's something that Brock has already thought about and acted on—having the ability to be energy self-sufficient in the face of climate change and extreme weather events."

When a massive blackout darkened the eastern U.S. and a portion of eastern Canada in 2003, the cogeneration plant switched to island mode and powered the entire campus. Brock has numerous sensitive research-intensive facilities, such as a containment level 3 (CL3) insectary lab, which is used for the isolation and identification of Category 3 pathogens, and a select number of Category 2 pathogens that may pose a risk to the laboratory staff handling them. Because the cogeneration plant can operate on island mode, Brock is able to protect these valuable facilities.

Beyond meeting all of the university's energy needs, the cogeneration plant serves as a living lab for students to participate in hands-on learning, Quintana says. For example, chemistry students can observe firsthand the thermodynamic processes at work in a lithium bromide chiller.

As an added bonus, the entire District Energy Efficiency Project has greatly reduced Brock University's deferred maintenance backlog—a metric that all college campuses watch closely, Johnstone says.

Strong legacy

All of the Cat engines in the former plant were original—the most operating time accumulated on an individual generator set was 162,000 hours. Combined operating hours on the older model G3516 generators totaled 1.25 million hours.

"Sustainability is at the core of all we do at Brock University. Brock's journey began in 1964, and has since become a leader in energy management. This project is taking us to the next level of performance efficiency, and represents the beginning of bigger things to come."

SCOTT JOHNSTONE
Associate Vice President of Facility Management
Brock University

"They were all original, we never replaced an engine or a generator in 24 years," says Brian Forbes, a mechanic who helps operate the plant. "I can't believe how long these engines lasted. I've never worked on any other ones, but I've heard stories of cogen plants failing, and ours just kept going and going."

Over the years, Brock staff have learned more about how to run the plant, and have taken a lead role in the operation and maintenance of the engines. Their Cat dealer, Toromont Power Systems, is called on to perform annual maintenance or attend to any operational issues where additional technical expertise is required.

"Brock has been collaborating with Toromont for more than 25 years to provide reliable, cost-effective energy to our campus community," Johnstone says. "We're now advancing this partnership with a new generation of high efficiency equipment. In addition, we are conducting research together to test new engine oils and additives to extend equipment life, all while making our plant more sustainable."

Sean Goodman, a product support manager in eastern Canada for Toromont Power Systems, notes that Brock and Toromont have successfully coexisted for 20 years without a service contract.

"I think what we have at Brock here is a little bit unique relative to other customers that we support, in that they have become very self-sufficient," Goodman says. "Toromont supports customers any which way they need to be supported, and that's from an operational standpoint, or just simply maintenance or emergencies that need troubleshooting. Whatever the role is, we embrace it."

Originally, because the former plant ran so efficiently, Forbes questioned the need to replace it.

"But the more we looked at it, the technology has evolved so much," Quintana adds. "The efficiency on the new Cat engines is so much higher than the previous engines."

After a lot of discussion, research and planning, Brock's facilities management team concluded that the G3516H series was the best option to support the university's growing community for the next 25 to 30 years.

Johnstone says savings and efficiencies realized through the plant upgrade will reduce future utility costs, ensure a sustainable operation and keep pace with significant growth of a campus where enrolment has doubled since 2000.

"Sustainability is at the core of all we do at Brock," Johnstone says. "Brock's journey began in 1964, and has since become a leader in energy management. This project is taking us to the next level of performance efficiency, and represents the beginning of bigger things to come."

BROCK UNIVERSITY

Brock University is a public research university located in St. Catharines, Ontario, Canada. It is the only university in Canada that is located in a UNESCO Biosphere Reserve, located at the center of Canada's Niagara Peninsula on the Niagara Escarpment.

Brock University is the only school in Canada and internationally to offer the MICA (Mathematics Integrated with Computing and Applications) program. The university's Department of Health Sciences offers the only undergraduate degree in Public Health in Canada.

Graduates enjoy one of the highest employment rates of all Ontario universities at 97.2 percent.

Type:	Public
Established:	1964
Affiliation:	non-denominational
Endowment:	$83 million
Academic staff:	600
Administrative staff:	919
Students:	19,200
Undergraduates:	16,148 full-time 2,640 part-time

brocku.ca

A SOUND APPROACH

CATERPILLAR® STRIVES TO PROVIDE THE QUIETEST GENERATION PRODUCTS POSSIBLE

Studies have shown that exposure to excessive noise contributes to not only hearing loss, but also stress-related illness, high blood pressure, speech interference, lost productivity and sleep deprivation.

Unfortunately, testing and guidelines for sound regulation of electric generation products have never been clear in the United States.

Prior to the 1980s, the United States Environmental Protection Agency (EPA) found that noise levels affected health and safety in negative ways and regulated noise control through its Office of Noise Abatement and Control. The group successfully passed two legislative pieces before the task was handed to state and local governments due to lack of funding in 1982.

Despite being left unfunded, standards established by the Noise Control Act and Quiet Communities Act of 1972 are still applicable, as they were never rescinded by Congress. The problem lies in the outdated legislation as technology progresses and demand grows for large electric generation products.

Because no federal regulation sets specific sound limits for large electrical generation products, varying and often conflicting regulations are set forth by states and municipalities, making it difficult and confusing for generator set operators who wish to be good corporate citizens and neighbors.

While most of the responsibility falls on state and local governments, overlapping guidelines from hundreds of governmental bodies are confusing for manufacturers, customers and the public. This results in disparate sound regulations, testing and standards, which can pose a threat to public safety.

Ultimately, the responsibility lies with generator set manufacturers to practice social responsibility and provide safe equipment.

Caterpillar Standards

Despite confusion surrounding the actual limits of noise output for electric generator sets, Caterpillar continues to improve the sound attenuation of its units to provide the quietest products possible. Since many local ordinances set numeric sound pressure limits, it is essential to provide customers with accurate information regarding the noise production of their generator sets.

To ensure that this need is met, Caterpillar performs extensive and thorough sound testing of all of its generator sets in production. Currently, Caterpillar conducts tests based on SAE and ISO standards.

Also, because these units are utilized globally, they may be tested at both 50Hz and 60Hz power. Using the captured sound pressure measurements, the ISO standards are applied to calculate sound power, which allows for the estimation of sound pressure at any point (distance) around the generator set.

Sound measurements are usually taken at only a few points around the machine. By taking multiple measurements around the generator set, Caterpillar can much more accurately predict the sound output of its products.

Despite the high cost associated with sound testing, Caterpillar continues to invest in these tests to manufacture the highest quality products and provide customers access to the most accurate sound information possible.

For more information, contact the power systems experts at our dealership.

NATIONAL SECURITY

FORT KNOX A MODEL FOR ENERGY RESILIENCY

Energy and water are fundamental elements of the readiness and resilience of the U.S. Army. The occurrence of a major power grid outage may be out of the Army's control, but preparing for a disruption and the aftermath is not, according to J.E. "Jack" Surash, PE, Acting Deputy Assistant Secretary of the Army for Energy & Sustainability.

Potential threats to Army energy, water and land resources are growing in scope and complexity at home and abroad. Army energy systems are vulnerable to cyberattacks, progressively sophisticated enemy weapons, and increasingly frequent and severe weather events.

"The future of Army energy must be focused on energy resilience and security, because the ability to prepare for and recover rapidly from power disruptions is more critical than ever to warfighting readiness," Surash said in an article published in *District Energy* magazine.

Given these potential threats, the Army is working to move beyond energy and water projects that simply increase generation options, or save money, to projects that incorporate resilience—including microgrids and combined heat and power systems. The 2007 Energy Independence and Security Act requires a higher level of energy security at military installations.

In fall 2014, Fort Knox completed a $60 million energy project that provides the sprawling base with 44 MW of peak-load power. Four of six gas-fired Cat® G3520C generator sets supply power to the base 24/7 through a combined heat and power (CHP) system.

The installation also includes 10 Cat 3516C diesel gensets that are used primarily for backup power. The gas and diesel units are housed in six separate power stations that comprise the microgrid at the 109,000-acre base, which is located 35 minutes south of Louisville, Ky.

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CUSTOMER PROFILE

Nolin RECC

Location: Fort Knox, Ky. (U.S. Army post)

Weekday Population: 25,000, including military personnel, soldiers and civilians

Application: Combined Heat and Power, Peak Shaving

Cat® Equipment: 3516C generator sets (10); G3520C generator sets (6); 15 kV utility and generator paralleling switchgear (6)

Passing the test

Last fall, Fort Knox engineers conducted an energy resilience test by cutting off grid power and operating the base on its own energy resources. Prior to this most recent test, Fort Knox engineers had performed several smaller shutdown tests to the post's individual substations.

At the request of Fort Knox, utility privatization contractor Nolin Rural Electric Cooperative Corp. (RECC) shut down all of Fort Knox's substations, disconnecting from Louisville Gas & Electric—the electric and natural gas provider for the region—and operated independently with its own energy resources, something no other Army installation has tried.

The plan was to shut off power at 10 a.m. on Oct. 24, and switch to decentralized power generated at Fort Knox within 10 minutes, said R.J. Drydek, energy manager for Fort Knox's Directorate of Public Works.

A hitch in the test occurred when the breaker to the power generation station for U.S. Army Human Resources Command wouldn't close. Following a reset, the substation locked in and started powering up about 14 minutes into the test.

"The thing to keep in mind is that anything could happen, but we are reasonably prepared and have a contingency for just about anything we can think of," said Greg Lee, president and CEO of Nolin RECC. "We do test this in the middle of the night every six months."

CHP pays for itself

When the project was developed, the conclusion was that CHP was the most effective way to give Fort Knox both the energy security and energy savings that it needs, said Tom Abele, a vice president for project developer Harshaw Trane.

"We were hired to provide energy security to the base, and the challenge was to do it in a way that paid for itself," Abele said. "We ran multiple scenarios and considered various solutions to try to accomplish this. We looked at alternative fuels, biodiesel, waste-to-power, coal, and big turbines. Nothing made as much sense as CHP."

Beyond providing energy security, the power system reduces the base's energy costs by an estimated $5.5 to $6 million per year in energy savings.

"So that's goal number one, and Fort Knox is achieving that, as one of the best, if not the best military base in the world in terms of overall energy reduction," Abele said.

Louisville-based Whayne Supply Company supplied the power generation side of the project, helping determine the right selection of cogeneration engines to meet the base's power needs.

"This project was three years in the making and involved multiple facets, including supplying switchgear, gas and diesel generator sets, and other ancillary equipment," said Steve Killian, an electric power gas and microgrid product sales representative who coordinated the Fort Knox installation for Whayne Power Systems. "Our role doesn't end once the installation is complete—we continue to partner with Nolin RECC to ensure the generators continue to operate at peak efficiency."

The selection of the Cat generator sets at Fort Knox was based on the fact that they were the right fit for the project, their reputation for durability, and also the close proximity to the resources of Whayne Power Systems in Louisville.

"Along the way, no matter how well you've prepared, there have been certain things that just couldn't be forecast," Lee said. "Fortunately for us, we've had the Whayne technicians and

engineers who can resolve any issues we encounter, or put us in touch with the right people at Caterpillar."

Tapping into reserves

Pat Walsh, director of DPW, said about 2,000 facilities, including 1,500 homes, get their power from the Fort Knox grid. Dyrdek said that with the kind of reserves they can tap into from heat, natural gas and other forms of energy, Fort Knox can actually run independently for an indefinite amount of time during an emergency. The current minimum, based on Army regulations, is 14 days.

The military post has become a center for human resources with the relocation of the Army Human Resource Command Center to Fort Knox in 2009 from the Washington D.C./Virginia area. In May 2010, the Army Human Resource Center opened following the largest construction project in the history of Fort Knox. The $185 million, three-story, 880,000-square-foot complex of six interconnected buildings is the largest office building in the state, employing nearly 4,300 soldiers and civilians.

U.S. Rep. Brett Guthrie and other Kentucky congressmen were instrumental in getting legislation included in last year's National Defense Authorization Act (NDAA) that assured Fort Knox's continued focus on energy resilience.

"Our military must be ready to face any number of threats around the world," Guthrie said. "The (2018) NDAA improves our military readiness and supports our troops. We ask our servicemen and women to put their lives on the line for us, and we must make sure they have the best care we can provide for them.

"It makes Fort Knox unique, and it makes it better for other missions, and for opportunities for growth," Guthrie said. "And it's safety and security for our soldiers, which is first and foremost."

Surash said that while he hasn't had the opportunity to get around to every installation working on energy resilience, he was very impressed with what Fort Knox accomplished.

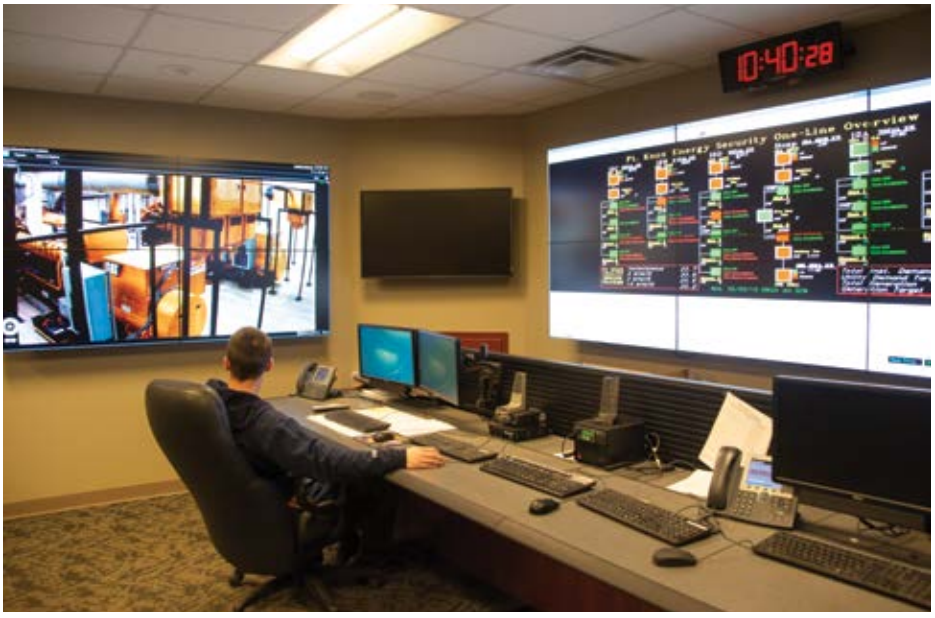
"The capabilities at Fort Knox seem to be one of the best with respect to energy resiliency that I'm aware of," Surash said. "I was happy to see that they actually tested that capability. It's one thing to have a capability, but until you test it, you really don't know what's going to work and what's not going to work.

"As it turns out, the system worked as designed."

Fort Knox was originally featured in the Spring 2015 issue of ***RunReady*** *magazine.*

"The thing to keep in mind is that anything could happen, but we are reasonably prepared and have a contingency for just about anything we can think of...we do test this in the middle of the night every six months."

GREG LEE
President and CEO, Nolin RECC




CAT
DANGER
NOTICE

GEARING UP

Switchgear upgrade is mission critical for data center

As technology is continually updated to increase performance, keeping electrical switchgear up to date is critical to drive operational efficiency and remain competitive.

For enterprises that require power that's always on and never fails, paralleling switchgear is a key component that needs to be maintained so that it can transfer emergency loads from a standby generator at a moment's notice.

But with an expected lifecycle of around 15 to 20 years, budget constraints can lead facility managers to postpone modernization to the last possible minute. This can increase the risk of electrical failures such as unplanned outages that lead to costly downtime—which, in the case of a data center, can have a major financial impact and damage the company's reputation.

What's more, replacement for aging equipment can be tricky as the availability of older spare parts decreases while the price for newer parts increases.

While generator sets receive the most scrutiny when it comes to maintaining and testing a standby power system, switchgear typically receives minimal attention until something fails or a component becomes obsolete, says Jeff Miller, EPG service manager for Foley Power Solutions in Kansas City.

"Frequently, the switchgear and automatic transfer switches are forgotten, so our team goes out and conducts thorough site evaluations and preventive maintenance," Miller says.

Armed with that information, the Cat® dealer confers with engineers at Cat Switchgear in Alpharetta, Ga. to determine if there are any obsolete or end-of-life parts. If that's the case, Cat Switchgear will make recommendations, at which point a representative from Foley Power Solutions will go back to the client and present options for upgrading their system.

Likely candidates for switchgear upgrades include hospitals, data centers, pharmaceutical plants and manufacturing facilities, Miller says.

"Anyone that has infrastructure or mission-critical operations where the power cannot go down should evaluate their switchgear for a possible upgrade," he says.

By having detailed, up-front conversations between a customer, Cat Switchgear and Foley Power Solutions, an integrated plan can be put in place to reduce operational risks while at the same time maintaining the most redundancy possible during the upgrade, Miller says.

Making the case

Located in Lenexa, Kan., the TierPoint data center project is a prime example of this methodology. With 40-plus company-owned and operated data centers throughout the U.S., TierPoint is one of the largest privately-owned colocation data center providers in the United States. While the data center in Lenexa began operating in 2012, it was in line for a switchgear upgrade last year when an audit determined the system had some components that were nearing obsolescence.

Based on the recommendation from its Cat dealer, the Lenexa data center opted for an upgrade to 4,000 amp, 480V low voltage switchgear that is housed in two identical electrical rooms designed to ensure redundancy. The front end of the standby power system is anchored by two Cat 3516C diesel generator sets that supply a combined 2.5 MW of power to the data center in an N+1 configuration.

The Lenexa data center comprises 56,000 square feet, with 10,000 square feet of production-raised floor space built out and in operation, and an additional 10,000 square feet that can be built out for future clients. The Lenexa data center supports a wide range of customers—including major financial institutions, pharmaceutical companies, and small businesses.

"Our clients expect us to maintain 100 percent uptime, and if we don't maintain that then we're not providing the best solutions for them," says Andrew Watkins, manager of TierPoint's Lenexa data center. "If we lose power, it could have dire consequences for our customers.

"So when Caterpillar and Foley Power Solutions came to us saying that

Continued on page 14

CUSTOMER PROFILE

TierPoint Data Center

Location: Lenexa, Kan.

Application: Standby power

Cat® Equipment: 4,000A, 480V Switchgear (2), 3516C diesel generator sets (2)

some of our gear was coming to end of life, we wanted to make sure that we could keep that 100 percent uptime," Watkins says. "It was an easy decision to opt for the switchgear upgrade."

Working in tandem with Foley Power Solutions, engineers from Caterpillar Switchgear evaluated the TierPoint system in early 2018.

"We evaluated all the components within the gear, and then we took that information back to the factory and had the engineers take a look at what needed to be replaced or upgraded, what could stay and then we came up with a solution for TierPoint," Miller said.

In advance of the installation, Watkins visited the Cat Switchgear facility in Alpharetta, Ga. as part of a factory witness test.

"I was able to sit down for two days and try to break down what they were recommending we upgrade," Watkins said. "I got to take a tour of the facility and actually see how they build their switchgear. So not only did I get to go out and test run my upgrade, but I got to actually see it being built out."

Highly structured process

In order to maintain 100 percent uptime at the data center during the upgrade, a highly structured method of procedure (MOP) was developed and carried out from the beginning of the switchgear upgrade all the way through completion.

"When it was presented to us that we needed to upgrade our switchgear, we sat down and came up with a great game plan—a step-by-step process of what we needed to complete the job," Watkins said.

The detailed MOP enabled technicians to upgrade one switchgear electrical room at a time. Certified technicians from both Cat Switchgear and Foley Power Solutions performed all the upgrades, then tested each one to make sure it was functionally operating.

"Once the 'A' side switchgear lineup was completed, it was operationally proofed, checked for quality control, then functionally tested and commissioned," Miller said. "Then two months later, we went to the other switchgear lineup in Electrical Room 'B' side and did the same thing."

The ability to partner with TierPoint and Cat Switchgear in the planning of the project well in advance of the actual site upgrade is what allowed this project to flow seamlessly at implementation time, Miller said.

The modernization was conducted by two technicians from Cat Switchgear along with Cliff Putoff, a master technician from Foley Power Solutions.

"We've been doing a lot of upgrades with Cat Switchgear, and they're carefully scripted," Putoff said. "They start on one day and end the next day or in the following days depending on the size of the upgrade, and no there are no hiccups. By the time the new equipment arrives, all the software is loaded and configured. The upgrades are plug and play—there's no trying to figure out what's going to happen later. It all comes off on time."

Modernization of TierPoint's switchgear was completed ahead of schedule, Watkins said. During the upgrade, representatives from Foley and Cat Switchgear provided TierPoint with regular updates on the progress of the project.

"We were having to provide updates all the time to not only our customers, but to our upper management, and that made it essential to keep us in the loop and complete the project on time," Watkins said. "It was great—it worked out well."

Once the system was updated, a functional test was conducted.

"We ran through a complete scenario from our viewpoint, and then also from the customer's standpoint—any test that could be run, we ran it," Putoff said. "We verified that everything worked correctly and was integrated well. And

"When Caterpillar came to us saying that some of our gear was coming to end of life, we wanted to make sure that we could keep that 100 percent uptime. It was an easy decision to opt for the switchgear upgrade."

ANDREW WATKINS
Manager, TierPoint - Lenexa Data Center

then the customer had us go through and do a functional test, making sure all the points came in from the generator, and that everything showed up on the screen."

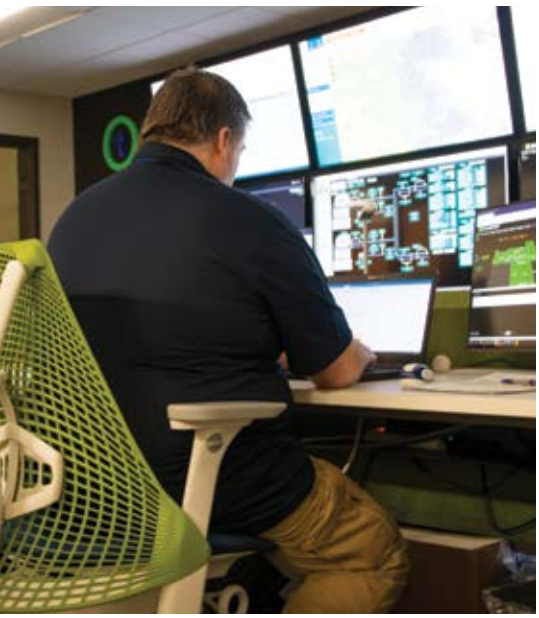
Enhanced functionality

One of the advantages of modernization includes new PLC processors, which enable the standby power system to process faster, which is key for a data center. The upgrade also includes enhanced graphics, timers, and color-coded alarms. Updated HMI software and new graphics were integrated into the system to provide TierPoint with better recognition of alarms and a clearer understanding of how to operate the system.

"Previously, we had no idea when our standby power was going to shut off, or how long it had been running," Watkins says. "That's huge when it comes to our business. I want to know how long we've been running on that generator and when we're going to be transferring back—how many minutes I have remaining before it goes back on utility power—so having the main HMI screen countdown timer is huge for our business.

"And the enhanced graphics that came with the switchgear upgrade provide a lot more functionality to be able to utilize our equipment to see what's going on in real time," Watkins adds.

Once the upgrade was completed, Cat Switchgear provided a full day of instruction to the TierPoint team, training them on how to utilize the graphics, as well as an operational review of how the switchgear works.



Dealer-factory support

When the Lenexa data center was built in 2012, Foley Power Solutions was an integral partner in the delivery, installation and commissioning of the Cat generator sets and switchgear, ensuring that the original paralleling switchgear was in sync with the generators, Watkins said. The Cat dealer provides ongoing support and maintenance of TierPoint's standby power system.

"When it comes to preventive maintenance or any type of repairs that we need on our generators, I make one phone call and they're here within an hour," Watkins says.

"Their technicians are very knowledgeable—probably the best in the industry," he adds. "I've dealt with many other companies throughout my career, and when Foley technicians come out, they can diagnose the problem and they can find the solution quicker and faster. If I ask questions, they are able to answer those questions on the spot, where others usually say they have to get back to me.

"Foley has been a great partner with TierPoint," Watkins says. "And going through the Cat Switchgear upgrade has given us an added level of confidence, as we were a direct recipient of first-rate factory support."

TierPoint Data Center

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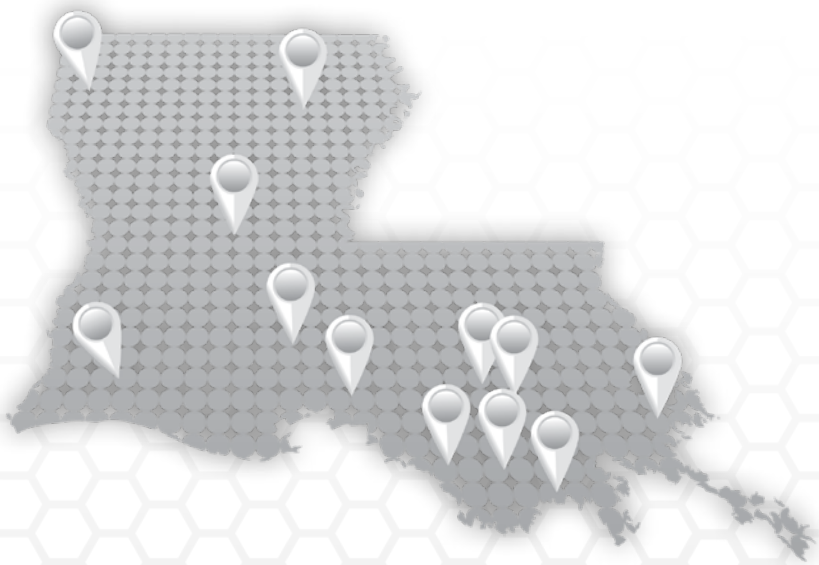

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