A Caterpillar® publication for Power Professionals WINTER 2020

RUNREADY™

PROJECT RUNWAY

SWITCHGEAR UPGRADE ENSURES AIRFIELD LIGHTS STAY ON

LIFE PRESERVER

Tennessee aquarium relies on Cat® GC Genset to keep the power on

SAFE ISLAND

CHP plant makes hospital a leader in energy resiliency

CAT®

Get in Gear

As an essential part of an electric distribution system, switchgear is engineered to safely and reliably manage power through complex sequencing.

While diesel and gas-powered generator sets typically require fewer upgrades as they age, switchgear technology requires regular attention and periodic upgrades as components become obsolete over time.

The team at Foley Power Solutions Advanced Electrical Services conducts periodic inspections of its customers' switchgear to determine if an upgrade is necessary to help prevent unexpected equipment failures. This issue features a story about how the Cat® dealer worked in tandem with engineers at Cat Switchgear to perform a comprehensive upgrade at Kansas City International Airport.

Also in this issue, Caterpillar's new line of GC generator sets is gaining popularity in various standby power applications. The new GC gensets offer excellent value by delivering performance within a minimal footprint. Those features and a longstanding relationship with its Cat dealer led the Tennessee Aquarium to replace an old generator with a Cat GC C13 genset to backup critical power to the facility.

Meanwhile, a hospital in New Jersey is powering its cogeneration plant with a Cat G3516H gas generator set. The advantages include energy savings and resiliency in the event of a widespread outage on the utility grid, such as occurred with Superstorm Sandy in 2012.

Happy Holidays and best wishes for the New Year.

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DID YOU KNOW?

Powering the Games

Cat® generator sets have a long history providing dependable power at sporting events. In 1988 a $1 million (Canadian) contract was awarded to lease and service 27 generator sets—mainly as primary and backup power for television cameras, commentators' booths and media centers for broadcasting the Winter Olympics to the world.

Twice during the games, utility power failed at a center that housed international press corps and ABC media.

"The [control panel] buzzer went off, so I knew something was wrong," said a Finning technician stationed at the site. "The Cat 3508 gensets kicked in full power until the utility company's power stabilized. Everything worked 100 percent just like it was supposed to."

The Cat dealer's strategy worked so well it has been replicated at subsequent Olympic games.

STABILIZING FORCE

San Matías is a small town and municipality in Bolivia, South America, near the border with Brazil. The remote town is growing fast, as the population has nearly tripled to approximately 15,000 since 2001.

Due to its remote location, San Matías has no access to the interconnected national electric grid. It derives its electrical energy from a stand-alone natural gas generation plant.

Due to rapid population growth, a prevailing hot climate and unavailability of one of the power plant's existing generators, this created the need to temporarily install a Cat® diesel generator in April 2019 to cover the additional power demand in order to maintain the reliability of the service.

In order to reduce fuel costs which had increased with the use of the diesel generator, there was a heightened need to acquire a new gas-fueled genset that could operate effectively at high ambient temperatures up to 38°C (100°F). Cat dealer Finning was chosen to supply a power solution—a Cat G3512H gas-fueled generator set—the first of its kind in the eastern region of Bolivia.

Commissioned in March 2020, the Cat genset generates 1470 kW of continuous effective power and has high electrical efficiency of 42.6 percent, as well as being fuel efficient. Also, the high transient response of the Cat generator set provides stability to the network. This capability has established the G3512H as the base equipment of the San Matías plant.

A key factor in ENDE Guaracachi's selection of the Cat genset was the strong product support provided by Finning.

"We are proud to be able to participate in this type of project where we bring reliable and efficient energy to remote communities in Bolivia," said Roberto Velasco, commercial head of energy and motors for Finning in South America.

CONTENTS

IN THE SPOTLIGHT:

FEATURES

Commissioning

Electrical commissioning helps alleviate the risks that facility managers face in dealing with complicated building systems. Even building insurance carriers are starting to realize that buildings that have been subjected to system commissioning are safer for insurance purposes. Count on highly trained Cat® dealer technicians and power professionals to commission your distributed generation system.

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PROJECT RUNWAY

SWITCHGEAR UPGRADE ENSURES AIRFIELD LIGHTS STAY ON

CUSTOMER PROFILE

Kansas City International Airport (KCI)

Location:
Kansas City, Mo.

Application:
Standby power

Cat® Equipment: 3512B diesel gensets (2), 4160V 1200A Switchgear

As Kansas City prepares to unveil a modern new airport terminal in 2023, behind the scenes a critical systems upgrade took place in December 2019.

As construction continued on the $1.5 billion Single Airport Terminal, technicians from Cat® dealer Foley Power Solutions assisted specialists from Caterpillar in upgrading electrical switchgear that provides emergency backup power to the airport's runway lights. The runway lights must be illuminated at all times to provide navigational aid to pilots, while the chillers provide air conditioning to the passenger terminal.

The Cat Switchgear is an integral component of Kansas City International (KCI) airport's standby power system, and includes two Cat 3512B diesel generator sets that can parallel with the utility grid, or go it alone should grid power be lost.

"One of the most critical places here is the airfield," says Kenneth Williams, fleet asset manager for KCI. "Usually when we anticipate severe weather conditions we want the generators already running. That way, it's a matter

of switching over to backup power so our airport controllers don't get a big glitch which could cause flight delays and safety issues. So, it's really critical for us to have those airfield lights on at all times."

The Cat gensets and switchgear at KCI were installed in 2004. While generator sets tend to stand the test of time, switchgear is technology that requires regular attention and periodic upgrades.

"People tend to think that switchgear never fails," says Steve Messina, a product support and service (PSSR) for Foley Power Solutions. "It's a big piece of equipment that usually sits in a room by itself. As long as the generators are running right and they're testing them right, they tend to think everything is fine and dandy."

With the advance of technology, the timeframe for upgrades has been cut in half to once every 10 to 15 years, he says.

"Ten years goes by in a hurry, and little do they know that some of those parts will become obsolete," Messina says. "With technology, there's always an update, and it's the same with switchgear. Protective relays and PLCs become obsolete over a period of time, and that timeframe is getting shorter and shorter.

"There's a lot of switchgear units out there that are over 20 years old," Messina adds. "A lot of places just stay with the same equipment because it has worked. Normally they don't react until there's an issue. We want to make sure people understand that this equipment is crucial to the operation of the generators starting up in case of a major emergency."

Without properly functioning switchgear, in many cases the generator sets will not start automatically and require a manual start.

Hospitals and data centers are prime candidates for switchgear modernization, says Steve Holland, Advanced Electrical Services manager for Foley Power Solutions.

"If a data center's equipment goes down, it could cost millions of dollars a minute," Holland says. "And with a hospital, it could result in the loss of life if their backup power system does not function properly."

How the process works

When KCI's standby power system began experiencing some age-related

Continued on page 6

technical issues, two years ago the team at Foley Power Solutions conducted an assessment of the switchgear and subsequently recommended a comprehensive upgrade after consulting with electrical engineers at the Cat Switchgear facility in Alpharetta, Ga.

"When we identify a potential upgrade, we bring the experts in from Caterpillar, and they provide us with a solution as to what it will take to bring that component/system out of an obsolescent situation," Holland says.

"As with any technology, the PLCs and the relays and the HMI are left in the past," Holland says. "When it's not serviceable anymore or the next generation comes out, those particular products begin to become obsolete. It's not only on the switchgear itself, but it's also the generator control panels.

"In conjunction with modernization of the switchgear, we're also working with the installation of new, upgraded control panels on the generators so that we can make these two items work in unison. When those generators are called upon, they're ready to go."

The upgrade at KCI included the control panels on the generator sets (to EMCP4.2), as well as the PLCs, relays and HMI software on the switchgear.

Prior to the installation, Williams traveled to the Cat Switchgear facility for a factory witness test.

"We sat down, had a meeting and then we started doing our testing, and they were really helpful," Williams says. "They saw what our needs were and how we wanted the units to be configured. We're running two engines side by side, separately but together, and the way they helped program them was amazing."

Prior to the actual installation in Kansas City, dry runs were rehearsed back at the Cat Switchgear facility in Georgia. The Cat Switchgear team conducts dry runs to ensure that everything is correct when it arrives at its final destination.

"It's as close to plug and play as you can get," says Cliff Puttoff, a master technician from Foley Power Solutions who assisted on the project. "We did everything in stages to ensure that the airport was never down at any time. They always had one engine ready to go. We staged the process with Cat Switchgear and did everything in little steps to get there."

Two engineers and an installation technician from Cat Switchgear started with the simplest components and worked their way up. Puttoff and another Foley technician upgraded the control panels on the gensets, and also assisted on the switchgear upgrade.

"They drop one side of the gear down, rebuild it back up, and then they'll move over to the next side once side one is proved out," Puttoff says. "At the end of the test when all the gear is done, we run through every possible scenario that we can, including loss of utility power, bringing power utility back, as well as other scenarios. We do everything possible to make sure there are no surprises in the end."

Kenneth Williams (L) and Steve Holland (R)

"A lot of our guys that work with those generators like the new software. They like to see all the different graphics on the screen, and it's really helped them understand the various functions and how to operate the software."

KENNETH WILLIAMS,
Fleet Asset Manager, KCI

The final step involves familiarizing staff with operation of the switchgear, from simple startup to checking alarms.

"We go through everything we can until the customer is comfortable," Puttoff says.

The new switchgear includes an HMI software upgrade and enhanced graphics, which are more intuitive and easy to operate.

"A lot of our guys that work with those generators like the new software," Williams says. "They like to see all the different graphics on the screen, and it's really helped them understand the various functions and how to operate the software."

Foley Power Solutions can also add enhancements such as remote HMIs,

which provide the ability to view the status of the equipment from anywhere in real time, thereby reducing risk.

Dedicated service

As a PSSR, Messina's role involves talking to Williams on a regular basis to make sure the Cat dealer stays on top of service and maintenance. As part of a three-year Customer Value Agreement with KCI, Foley technicians perform oil changes at scheduled intervals, take fluid samples, and perform yearly preventive maintenance on the Cat Switchgear as well.

Customer Value Agreements (CVAs) feature individualized solutions for parts and service—all of which are designed to address the evolving needs and expectations throughout an asset's lifecycle. With a CVA, the focus is on delivering a customized outcome, such as hassle-free maintenance and engine protection.

"We have everything set up for routine maintenance, which has worked out really well for us," Williams says. "They take quite a bit of the pressure off us, especially with the generator. It's been a good relationship. It's an easy call and they always respond quickly. The Foley guys know our equipment, and that makes it so much easier."

The KCI switchgear modernization brings all components up to date and ensures the standby power system is operating correctly 24 hours a day, seven days a week.

"It's just peace of mind for the customer," Messina says. "They know it works because we thoroughly tested the system, and it's been working great with no problems. And that's money back in his pocket. We're not out here every month trying to update something or fix a problem. We put in all brand-new gear and it's going to be even more reliable going forward."

Foley Power Solutions offers clients a turnkey solution for electrical backup and prime power needs. Foley's ability to perform as prime contractor offers a hassle-free, comprehensive solution when installing or upgrading paralleling systems.

NEW TERMINAL OPENS IN 2023

When it debuted in November 1972, the three-terminal Kansas City International (KCI) airport was considered to be at the forefront of modern aviation. With runways designed for jumbo jets and visions of supersonic travel, it was an early example of "drive to your gate" design, the ultimate in airport convenience.

The terminals' once revolutionary design is now dated, space is cramped, and amenities no longer meet travelers' expectations. Added security requirements have also complicated the travel process by further reducing available space.

Over the years, there have been several initiatives to renovate the existing terminals or perhaps even construct an entirely new terminal. In 2013, the Kansas City, Mo. Mayor's Airport Terminal Advisory Group—together with the Aviation Department and its airline partners—concluded a new, single-terminal design would be the best option to bring KCI up to modern standards and amenities. Voters approved construction of the single terminal design in 2017.

At just over one million square feet, the Kansas City International Airport Single Terminal is the largest infrastructure project in the city's history. The structure will be built on the footprint of the airport's former Terminal A, which was decommissioned and demolished in the summer of 2019.

Completion is estimated in 2023, with 39 gates and the ability to expand to 50 in the future. The project will also include a 6,300-space parking structure. The new terminal will support more efficient airline operations and allow airport users to enjoy the convenience of modern air travel in a facility with updated technology and amenities, close parking, spacious gate areas, and ample food and beverage options.

"Travelers will be impressed by the wide-open spaces the moment they enter the terminal," says a KCI statement on the project. "Light and airy with a Kansas City feel, including our signature fountains, the KCI single terminal will be a different journey than before."

POWER DENSITY

MORE POWER FOR STANDBY & MISSION CRITICAL APPLICATIONS

The latest range of Cat® generator sets has been engineered with higher power densities to meet challenging restrictions on capital, site size, emissions, and cost. No matter the challenge, power through with proven standby power solutions engineered to maximize power output and reliability.

Cat power density products are designed to work with your industry.

Power density ratings for medium to large diesel generator sets from 706 to 3500 kVA (565 to 2800 ekW) will significantly reduce installed costs (up to 46 percent less than solutions from other manufacturers).

These proven platforms deliver the benefits of high power density to customers in every industry from healthcare to data centers, manufacturing to mining, and everything in between.

These new generator sets share the following characteristics:

- Conforms to ISO 8528-5 G3 requirements for steady state and load acceptance
- Accepts 100 percent rated load in one step
- Enables on-board paralleling with EMCP 4.4 controller

C18–60 HZ (500/ 750 ekW)

- Up to six percent better motor starting than products from other manufacturers
- Small footprint—other manufacturers require up to 33 percent more space
- Weighs up to 27 percent less than offerings from other manufacturers

C32–60 HZ (1100/ 1250 ekW)
Standby and Mission Critical

The newly rated C32 has a smaller footprint and up to 49 percent more power density than power solutions from other manufacturers.

- Up to seven percent better motor starting
- Weighs up to 33 percent less than offerings from other manufacturers
- Up to 3200A dual package-mounted breakers

3512C–60 HZ (1750 ekW)
Standby and Mission Critical

The 3512C has a smaller footprint and up to 34 percent more power density than power solutions from other manufacturers.

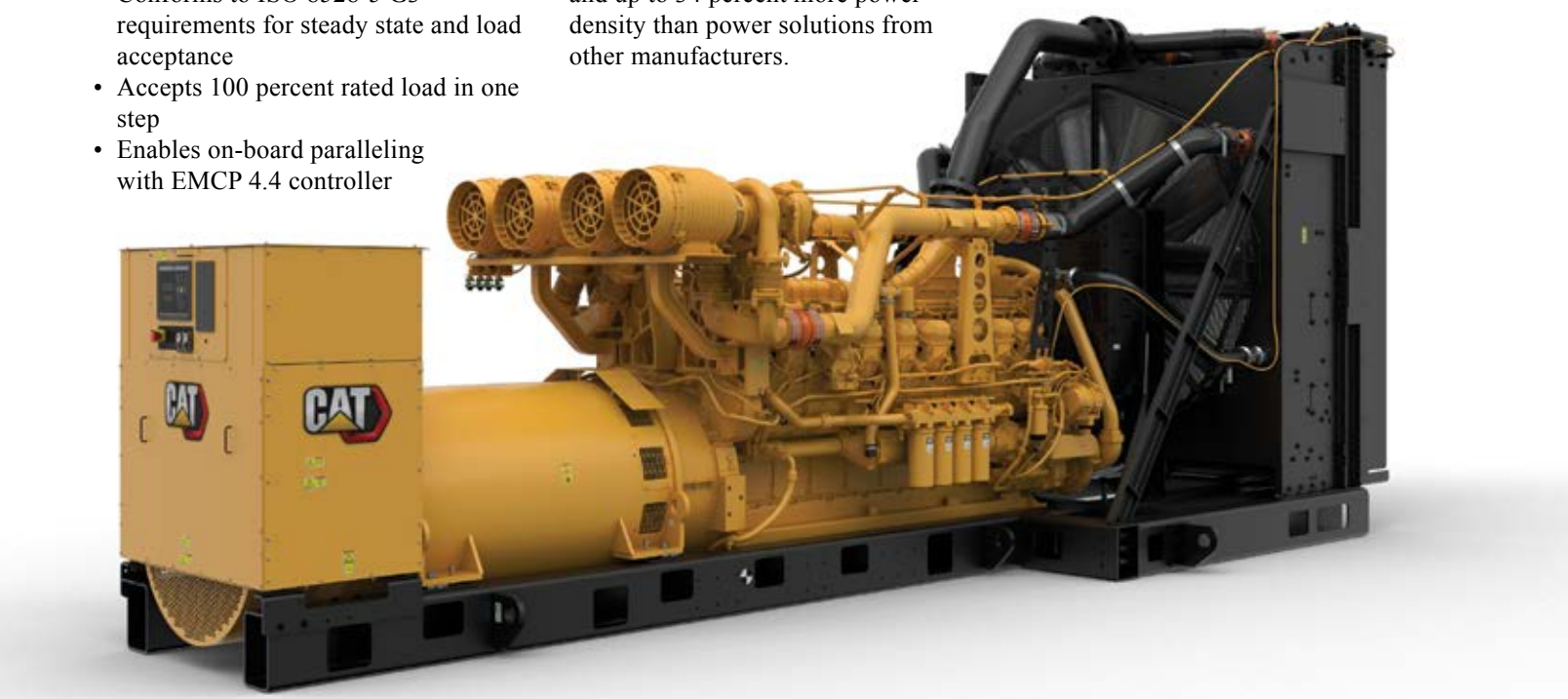
- Up to 37 percent better motor starting
- Weighs up to eight percent less than offerings from other manufacturers
- 122° F ambient capability
- Up to 16 percent lower fuel consumption

3516E–60 HZ (2750 ekW)
Standby and Mission Critical

The 3516E has up to 40 percent more power density than power solutions from other manufacturers.

- Up to 42 percent better motor starting
- Weighs up to 29 percent less than offerings from other manufacturers
- 122° F ambient capability
- Occupies 15 percent less floor space

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



LIFE PRESERVER

TENNESSEE AQUARIUM RELIES ON CAT® GC GENSET TO KEEP THE POWER ON

Since opening in 1992, the Tennessee Aquarium has attracted more than 25 million people to Chattanooga from all over the world.

The aquarium is consistently recognized as one of the country's top public aquariums. An independent research company ranks it as one of the top attractions in the country. This summer, the aquarium secured a top spot in *USA Today's* 10 Best Reader's Choice awards to determine the nation's premiere aquariums, finishing fifth.

Located on the banks of the Tennessee River in downtown Chattanooga, the non-profit public aquarium is home to more than 12,000 animals representing almost 800 species. The aquarium's exhibits are housed in two structures, the original River Journey building and the neighboring Ocean Journey expansion, which opened in 2005.

"You can come to downtown Chattanooga, and we can take you to places like Antarctica to meet penguins up close," says Thom Benson, vice president of communications and marketing for the aquarium. "We can take you to the depths of the Gulf of Mexico to see big toothy sharks, and we can show you some of the river giants like lake sturgeon that we're restoring in the Cumberland and Tennessee rivers, which are part of their historic range."

The Tennessee Aquarium Conservation Institute (TNACI) furthers the Aquarium's impact by conducting scientific studies, restoring the region's natural ecosystems and educating members of the public to take conservation action. TNACI conducts research to identify which southeastern waters have the greatest biodiversity. This knowledge is vital for conservation planning in the Southeast, because it can be used to identify hotspots of diversity that need protection.

Downtown revitalized

Dating back to its founding vision, the Tennessee Aquarium was designed to serve as a cornerstone for redevelopment in downtown Chattanooga by reconnecting the city with the Tennessee River. A 2014 study done for the Aquarium by the University of Tennessee Center for Sustainable Business and Development concluded that its annual economic impact is $115 million while supporting more than 1,300 jobs locally.

As downtown Chattanooga continues to develop, the city has emerged as an example of successful revitalization in older American urban areas. The aquarium is recognized as an outstanding example of the "Chattanooga Way," which relies on cooperation among

Continued on page 10

CUSTOMER PROFILE

Tennessee Aquarium

Location: Chattanooga, Tenn.

Application: Standby emergency power

Cat® Equipment: GC C13 generator set

TENNESSEE AQUARIUM

the city, foundations and private enterprise, plus a high degree of public involvement, to complete significant projects in the community despite limited government resources.

The aquarium is a living, breathing public attraction that is home for a remarkably diverse gathering of life. In order to sustain the proper life-support systems for so many creatures with unique requirements, maintaining a constant source of power is critical.

Cat® genset fills critical need

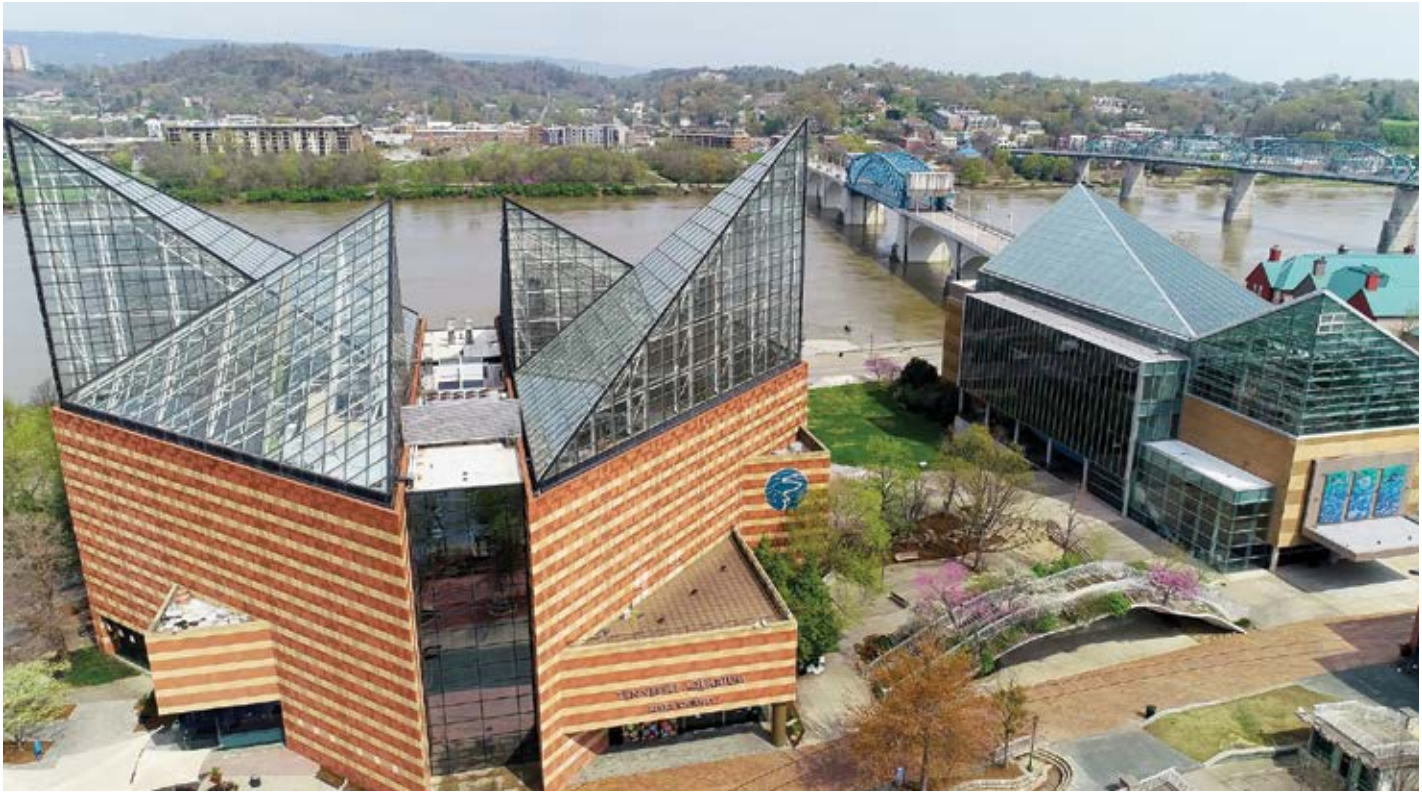
"When it comes to critical power need, we operate on the same level as a hospital," says Rodney Fuller, director of facilities and safety for the Tennessee Aquarium. "We have about 1.1 million gallons of water that houses our aquatic collection. We also have one of the largest collections of turtles and reptiles in the country along with some mammals. We have to make sure that the environment that they live in is as close as possible to what they would experience in the wild. So providing a clean, temperature-controlled environment is very critical, and having reliable power is a big part of that."

For the past 28 years, the aquarium had a standby generator on the roof of the River Journey building. But the generator set failed in October 2019, necessitating an immediate replacement.

Fuller reached out to Cat® dealer Stowers Machinery, which provided a rental power genset in the interim until a permanent replacement could be mounted on the roof. Ultimately, Fuller chose a Cat GC C13 generator set.

"I was very comfortable with going straight to Stowers for pricing on a unit that would be a great replacement for the generator which had been in place for over 28 years," Fuller says. "Our selection of Caterpillar is due to the name and the reliability, which is incredibly important to us."

Caterpillar's new GC sets are targeted for general standby applications including hospitals, agriculture, municipal infrastructure such as pump stations, water treatment plants, small



commercial enterprises, and small- to medium-sized office buildings. The aquarium's 350 kW genset is powered by a Cat C13 diesel with a mechanically-actuated electronic unit injection (MEUI) system. The genset is also EPA Tier 3 compliant.

A key feature of the new GC units is they are configured with a mix of common features in a predefined package, offering excellent customer value by delivering performance in a minimal footprint.

Compact size was a critical factor for the aquarium, which houses the standby generator in a relatively narrow opening on the roof of the River Journey building. The affordable cost of the GC C13 genset was also appealing.

"With the aquarium being a nonprofit organization, controlling costs is very important," Fuller says. "The new model offered us a price break that we were looking for, while still providing the functionality that we need."

The GC models come in sound-attenuated enclosures, which simplifies installation.

"We wanted to make sure the equipment was ready to go and as quiet as possible, because from the roof you do get sound that will transfer into some of our aquatic exhibits," Fuller says. "So, having that unit housed within a sound-attenuated box was very important as well."

"With the aquarium being a nonprofit organization, controlling costs is very important. The new model offered us a price break that we were looking for, while still providing the functionality that we need."

RODNEY FULLER, Director of Facilities and Safety, Tennessee Aquarium

New Cat GC C13 installation

For the new installation, Fuller coordinated with local electrical contractor Lawson Electric, and contacted a crane rental company to assist with moving the old generator off the roof and hoisting the new Cat generator into place. The installation was completed in late April and came off exactly as planned.

"My staff along with Lawson and technicians from Stowers teamed up to put the generator through several load tests, which made us feel very good about the product that we have," Fuller says. "Since April, the aquarium has experienced several minor outages, and our new Cat generator performed flawlessly."

The aquarium's facilities staff conducts weekly run tests without load and quarterly tests where the load is transferred and runs critical systems. As part of a Customer Value Agreement (CVA) the aquarium has with Stowers, technicians conduct thorough inspections and perform preventive maintenance on the Cat generator twice a year.

"We put a lot of pressure on our service providers," Fuller says, adding that the aquarium had an existing relationship with Stowers prior to installation of the new generator set. "We have very high expectations and they have not let us down. Stowers technicians are highly trained and qualified to service our equipment, and they've always been up front in telling us about anything they find while making recommendations."

In his role as chief communications officer, Benson is acutely aware of the importance of maintaining a constant supply of power, not only for the health of aquatic life, but also the guests.

"I was here when we had a big thunderstorm roll through, and the power clicked off, and within 10 seconds the power came back on," he recalls. "Our guests will kind of freeze for just a second when the lights go out, but when they come back on very quickly, you haven't even had time to think about what just happened because the power is restored so quickly. And that's a pretty special thing."

SAFE ISLAND

CHP PLANT MAKES HOSPITAL A LEADER IN ENERGY RESILIENCY

With roots that date back to 1907, Saint Peter's University Hospital is one of the few remaining Catholic hospitals in New Jersey. Based in New Brunswick, N.J., the non-profit acute care hospital provides a full scope of adult medical and surgical services.

The Children's Hospital at Saint Peter's University Hospital offers a full range of specialized pediatric healthcare services for newborns and children. Known as a regional leader in maternal health, it operates one of the largest maternity services in the country with over 5,000 deliveries per year. Its neonatal intensive care unit is nationally recognized by *U.S. News & World Report* as one of the top 50 in the United States.

Saint Peter's is designated by the state of New Jersey as a Specialty Acute Care Children's Hospital, Regional Perinatal Center, and Stroke Center and sponsors accredited residency programs in Internal Medicine, Obstetrics and Gynecology and Pediatrics. The teaching hospital is a clinical affiliate of Rutgers University's academic health center, Rutgers Biomedical and Health Sciences, providing full-time training to as many as 50 students in their third or fourth years of medical school. It also has a clinical affiliation with The Children's Hospital of Philadelphia.

In 2011, Saint Peter's embarked on an energy-savings initiative that included a comprehensive upgrade of electrical systems and installation of LED lighting throughout the hospital campus. In 2012, more than 10,000 solar panels were installed in four locations that provide about 20 percent (2.1 MW) of the campus' energy demand. The combined solar system is expected to save Saint Peter's approximately $10 million in electricity costs over the next 25 years.

CUSTOMER PROFILE

Saint Peter's University Hospital

Location: New Brunswick, N.J.

Application: Cogeneration

Cat® Equipment: G3516H gas generator set, **Diesel backup generators:** 3406, 3412, 3508 (2), switchgear

SAINT PETER'S UNIVERSITY HOSPITAL
Treating you better...for life.

CHP generates savings

Three years ago, the hospital doubled down on its commitment to energy efficiency when it began the installation of a 2 MW combined heat and power (CHP) plant, powered by a Cat® G3516H generator set fueled by natural gas.

With the addition of solar energy and cogeneration, Saint Peter's has extremely low utility energy usage compared to other hospitals in the state of New Jersey, averaging about 1 to 1-$^1/_2$ kilowatt hours per square foot (kWh ft^2). The average New Jersey hospital can operate at about 3-$^1/_2$ to 4 kWh ft^2.

By running its CHP plant continuously, Saint Peter's avoids the peak utility demand charge, saving $200,000 to $300,000 per year in energy costs.

"The cogeneration plant was part of a natural evolution over a period of years," says Leslie D. Hirsch, FACHE, president and CEO of Saint Peter's Healthcare System. "We've invested about $10 million upgrading our entire electrical system, and we've had a wonderful relationship with PSE&G as well as the state of New Jersey Economic Development Authority and have benefited from grants and low interest loans. We were one of the first hospitals in the state to really focus on resilient energy."

The $9.2 million CHP project was made possible by a $6.5 million grant from the U.S. Department of Housing and Urban Development for climate mitigation and disaster resilience, as well as a 10-year $1 million interest-free loan from PSE&G, which enabled the project to be launched sooner, as it covered portions of the project not covered by the grant or a low-interest loan, according to Garrick Stoldt, CFO of Saint Peter's Healthcare System.

"Now that we have CHP, we're fully operational 24/7 anywhere in the organization in the event of a loss of utility power covered by a storm or other outside event," Stoldt says. "That is especially significant for emergency medicine. We've become a refuge for our community in times of emergency."

Continued on page 14

When Superstorm Sandy lashed the region in October 2012, knocking out grid power, many people came to Saint Peter's seeking shelter and treatment. But with emergency generators providing backup to just the critical areas of the hospital, Saint Peter's lacked additional power to provide more than just emergency and inpatient care.

With the startup of the CHP plant in late 2018, Saint Peter's has the ability to operate in island mode in the event of a utility outage. It provides more power beyond the capacity of the four Cat diesel backup generators.

"The Caterpillar cogeneration plant is absolutely a game changer for us in terms of responding to natural disasters," Hirsch says. "I've had some personal experience with Hurricane Katrina, Hurricane Irene and Superstorm Sandy before I joined Saint Peter's, and in each of those disasters, one of the common elements was limited power."

"During a natural disaster, when you lose the electric utility and go on backup generator power, much of your operating function in the hospital is limited," Hirsch continues. "Some areas have full power and some areas don't. Your clinical functions are limited. The fact that Saint Peter's now has this cogen plant really makes us an island unto ourselves. It gives us the ability to function under normal and adverse circumstances with full power."

"The Caterpillar cogeneration plant is absolutely a game changer for us in terms of responding to natural disasters."

LES HIRSCH, President & CEO, Saint Peter's Healthcare System

"Most hospitals do not have 24/7 full-power mechanisms when the utility grid goes down due to a disaster. We, on the other hand, have that power 24/7—and that makes us unique in the state."

In the aftermath of Superstorm Sandy, many communities were without power for an extended period, and diesel fuel required to run backup generators was in short supply.

"The CHP system has given Saint Peter's an extra level of resiliency because it burns natural gas," observes Doug Boyler, chief engineer at Saint Peter's. "Diesel fuel was hard to get during Sandy, so this really strengthens us during a situation like a bad hurricane where we can run in island mode—it's a security blanket."

Capacity for expansion

Another benefit of the CHP system is that it provides coverage for future expansion of the hospital. A dilemma many hospitals face is that when they contemplate new building additions, the capacity of emergency diesel backup power becomes stretched. Cogeneration makes the most sense, particularly given that hospitals tend to operate on thin margins.

"We've actually future-proofed our hospital because most hospitals are at the very end of their load capabilities," says Andrew Schober, director of Engineering and Project Management at Saint Peter's. "They're teetering on needing to add more infrastructure, but prior to doing anything else, they need to add standby or prime power to back up the additional load.

"If we added another 500 kW or even 1000 kW in supported infrastructure, we would still be in almost that same footprint of energy usage with our CHP plant," Schober says. "It's actually to the point where I'm not looking at energy efficiency projects as my number one priority until I build more buildings. I don't think there's another hospital in the country that can say that."

Energy efficiency is another signature

piece of the cogeneration plant. The Cat G3516H was engineered to deliver best-in-class electrical efficiency and run for extended periods between maintenance intervals, which increases uptime and reduces owning and operating costs. Additionally, the G3516H has the highest power density, highest recoverable jacket water temperature, and lowest natural gas fuel pressure. These features helped the hospital install the equipment in a tight space, use the recovered hot water heat efficiently throughout the year, and fuel the generator without concern given the local gas utility's system pressure limitations.

Waste heat from the Cat generator set is recovered, resulting in Saint Peter's cogeneration plant operating at 75 percent or greater combined efficiency. Jacket water and exhaust heat from the generator are transformed via heat exchangers to produce hot water and steam that is used throughout the hospital. This "free" heat reduces the hospital's need to produce heat by 20 to 25 percent.

"We're not fully running the boilers at 100 percent, which gives us a lot more capacity if we were to need it," Schober says. "This has been a major windfall for the hospital."

Based on energy savings, the estimated payback for the CHP plant is three years, Stoldt says.

Timely support

Saint Peter's facilities staff monitors the CHP plant from an office inside the boiler plant and conducts regular inspections inside the CHP enclosure every two hours.

As of the first week of November, the Cat genset had operated for just over 15,000 hours with minimal downtime.

"It's been running all through the summer and beyond without any downtime at all," Boyler says. "Our Cat dealer (Foley Power Systems) has been really good, and if we have a problem, they dispatch service personnel that day to get us back up and running."

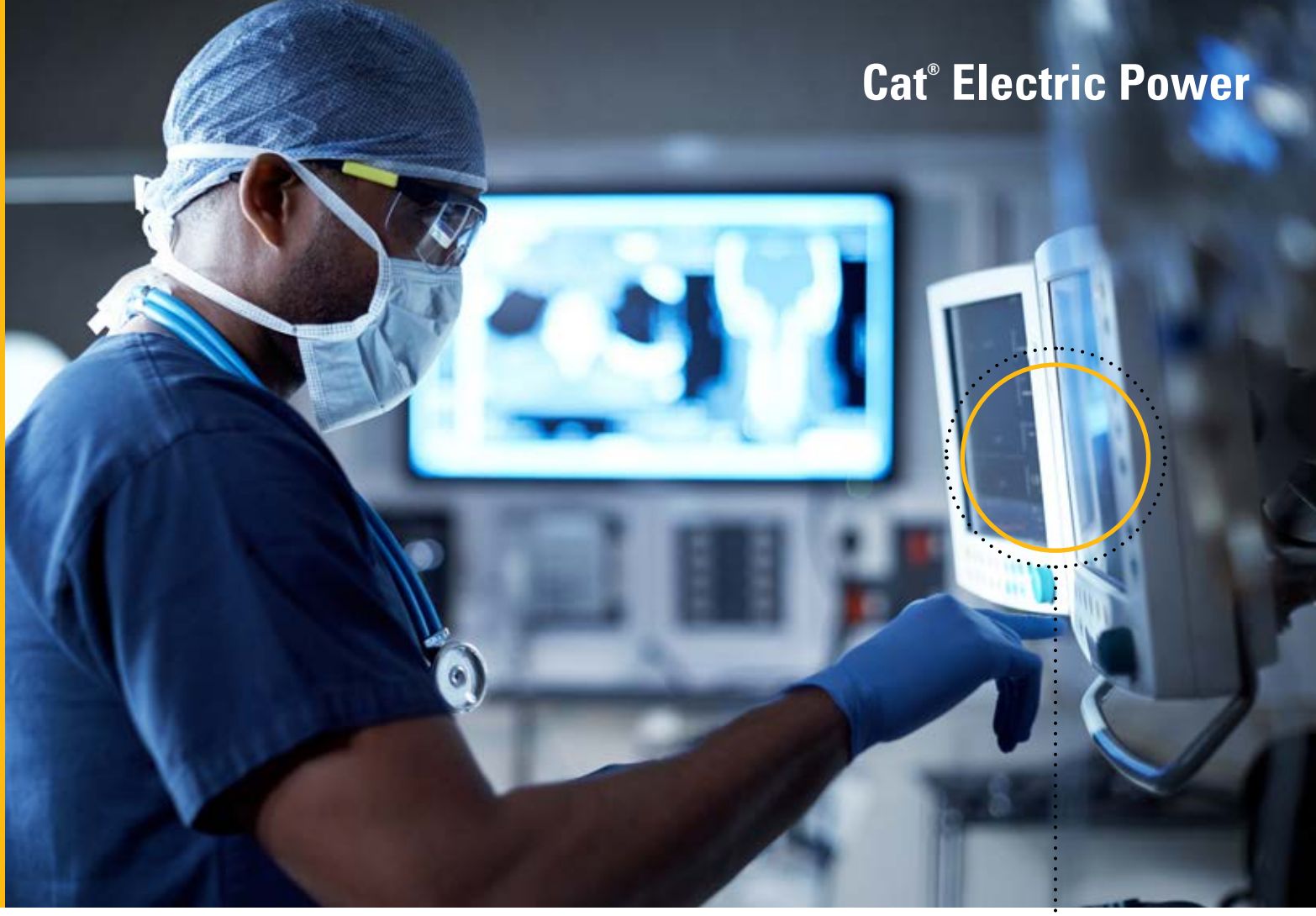
Foley Power Systems has an ongoing partnership with the hospital and plays a key role in helping Saint Peter's achieve its energy efficiency and resiliency goals. The Cat dealer's Product Support and Service team administers a Long Term Service Agreement (LTSA) to provide maintenance for the generator and other equipment.

"We take care of scheduled service tasks, and dispatch personnel whenever needed with parts and consumables that are usually in stock at Foley or can be shipped the same day," says Scott Yappen, director of Business Development for Foley Power Systems. "The net result is that Saint Peter's enjoys maximum annual uptime and energy production from its equipment."

Saint Peter's University Hospital has a long history with Foley dating back to 1988 when the Cat dealer installed the first emergency diesel generator.

"They have installed and maintained our generators," Schober says. "They provide rental equipment if we need a temporary backup generator, or even a backhoe or a front-end loader for snow removal. They demonstrated that they could provide the best equipment and service for this application. Also, we wanted to go with someone we trust and have a long history, and that was why we chose Foley for this project.

"Over the last two years, we haven't had a day where there was a critical need that they didn't help us meet," Schober adds. "We make a phone call saying we need help, and they understand how critical it is for patient care, and knowing that, people are not going to be in the dark at Saint Peter's University Hospital."



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