

RUNREADY™

LIFE UNDERGROUND

HISTORIC CAVE RELIES ON CAT® POWER
TO KEEP THE LIGHTS ON

FLIGHT PLAN

Cat gensets part of airport safety net

A CLIMATE OF CHANGE

New school deploys Cat microgrid



Lighting the Way

Knowledge of caves and karst processes is vitally important for protecting water supplies from pollution and overuse, and for understanding how water flows through karst aquifers. Caves can serve as a wealth of information about past environmental conditions, enabling hydrogeologists to access karst groundwater systems and study them from within.

With varied and often stunning rock formations, caves also serve as tourist attractions. Show caves have different requirements for light than that of individual cavers, because the light is installed and not mobile. Lights attached to electric wires must remain on for a long time, must be easy to handle, and should require a minimum of maintenance.

At Natural Bridge Caverns, a show cave attraction just outside San Antonio, a network of LED lights inside the caverns is always on, even when grid power fails. Five Cat® diesel generator sets, including a new D200 GC model, ensure that guests touring the underground passages are never left in the dark.

Meanwhile, a progressive school district in Portland, Oregon installed a Cat microgrid system last year at a new state-of-the-art high school. The microgrid ties in with the school district's climate policy, which strives to reduce greenhouse gas emissions while also educating students about climate change.

Also in this issue, a fast-growing regional airport in the Florida Panhandle guards against the loss of power at its main passenger terminal with two Cat G3516B gas generator sets. In order to ensure maximum reliability, airport officials upgraded the Cat switchgear that controls the standby system.

We hope you enjoy reading about these unique standby power applications.

DID YOU KNOW?



Biofuels Benefits

Cat® diesel generators can run on biofuels, and have accommodated the use of biodiesel and hydrotreated vegetable oil (HVO) for over a decade. These fuels are available now, and your local Cat dealer can provide guidance and recommendations for switching to renewable liquid fuels.

- HVO fuel is a drop-in replacement for diesel.
- Biofuels are available now and are easy to switch to.
- Lower visible smoke emissions when using biofuels.
- Running generators on biofuels provides similar performance to diesel.
- Although HVO and biodiesel do not significantly reduce CO2 emissions at the tailpipe, switching to biofuels will reduce lifecycle greenhouse gas emissions compared to diesel.
- Running on biofuel provides similar rated power output, transient response, start-up time, and NOx emissions to running on diesel.



DOUBLE DOWN Belgium biogas facility expands

Biogaz du Haut-Geer, a utility cooperative in eastern Belgium, is doubling its cogeneration capabilities and expanding the sustainability benefits of its biogas energy facility in Geer.

Cat® dealer Eneria designed, installed and commissioned the new combined heat and power (CHP) system that uses two Cat CG170-16 biogas generator sets with integrated CHP technologies to supply an additional 1.5 MW of power and 1.5 MW of heat while also providing redundancy.

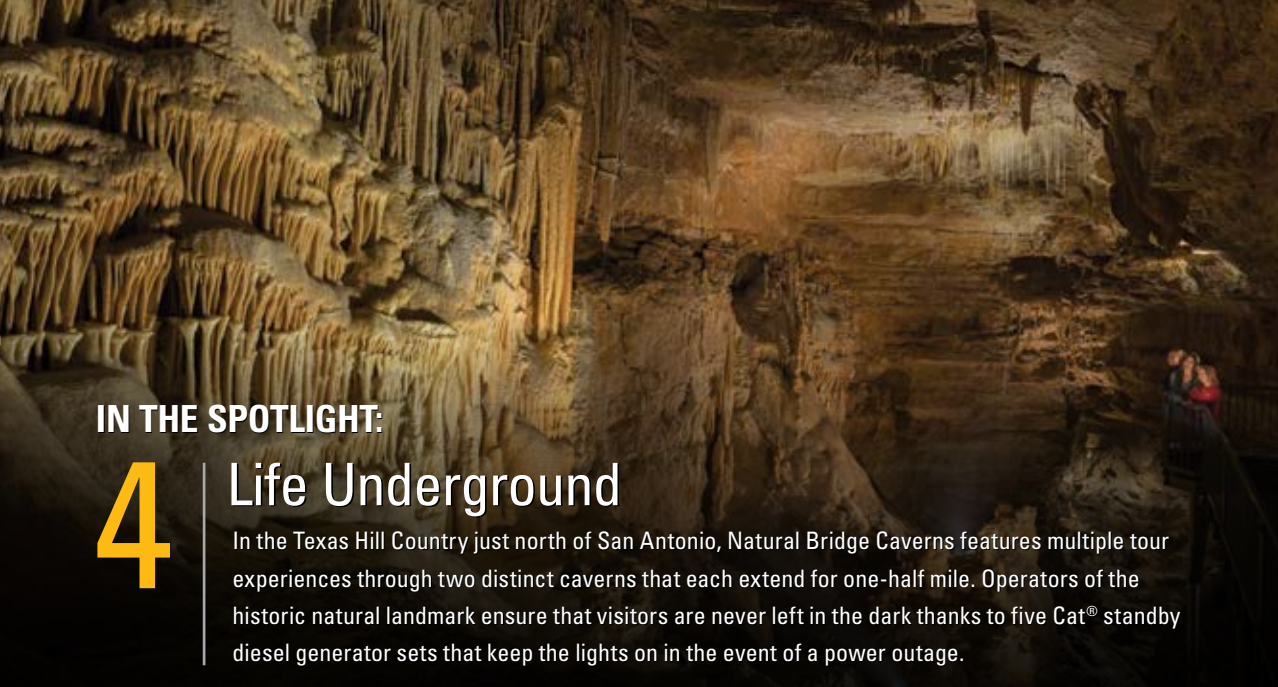
The Cat dealer is also providing components to help process the methane-rich biogas fuel for the systems, which is produced in anaerobic digesters from organic byproducts supplied by more than 30 food processing plants, local farmers and various other public and private partners. Additionally, Eneria supports the operation of the system through ongoing monitoring and maintenance.

The CHP system provides electricity and thermal energy for local industrial operations. Heat is used to optimize the biomethanization process in the digesters, help produce high-quality organic fertilizer, and remove moisture from wood chips that are pressed into briquettes for fuel and marketed under the Flameco brand name.

"The biogas system works 24 hours a day year-round, so efficiency, durability and reliability are essential for maximizing the return on our investment," said Gaëtan de Seny, managing director of Biogaz du Haut-Geer. "We have chosen field-proven CHP technologies from Caterpillar and Eneria's expertise to provide a robust solution that will help us maximize the performance and sustainability benefits of our biogas system."

The new CHP capabilities supplement an existing system anchored by three Cat CG132-12 generator sets that began producing 1.5 MW of power and 1.5 MW of heat in 2012. The current system produces biogas from 60,000 tons of biodegradable waste annually.

"Biogas energy facilities provide renewable energy in a very efficient way that improves the sustainability profiles of agriculture and food processing operations," said Sven Buehler, a Caterpillar Energy System Engineer for gas product sales. "Biogaz du Haut-Geer illustrates how a creative, multi-faceted approach can deliver a full cycle of benefits for local businesses, agriculture operations, residents and the environment."



IN THE SPOTLIGHT:

4 Life Underground

In the Texas Hill Country just north of San Antonio, Natural Bridge Caverns features multiple tour experiences through two distinct caverns that each extend for one-half mile. Operators of the historic natural landmark ensure that visitors are never left in the dark thanks to five Cat® standby diesel generator sets that keep the lights on in the event of a power outage.

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8 New Gas Gensets

Flexible fuel units in 20- to 200 kW range provide resiliency



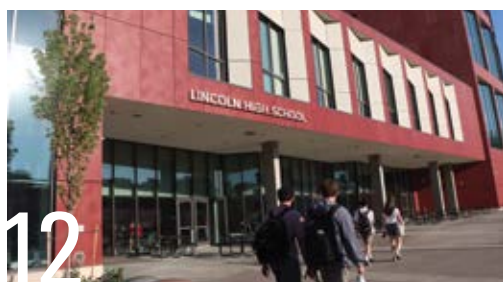
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Cat gensets and switchgear upgrade part of airport's safety net

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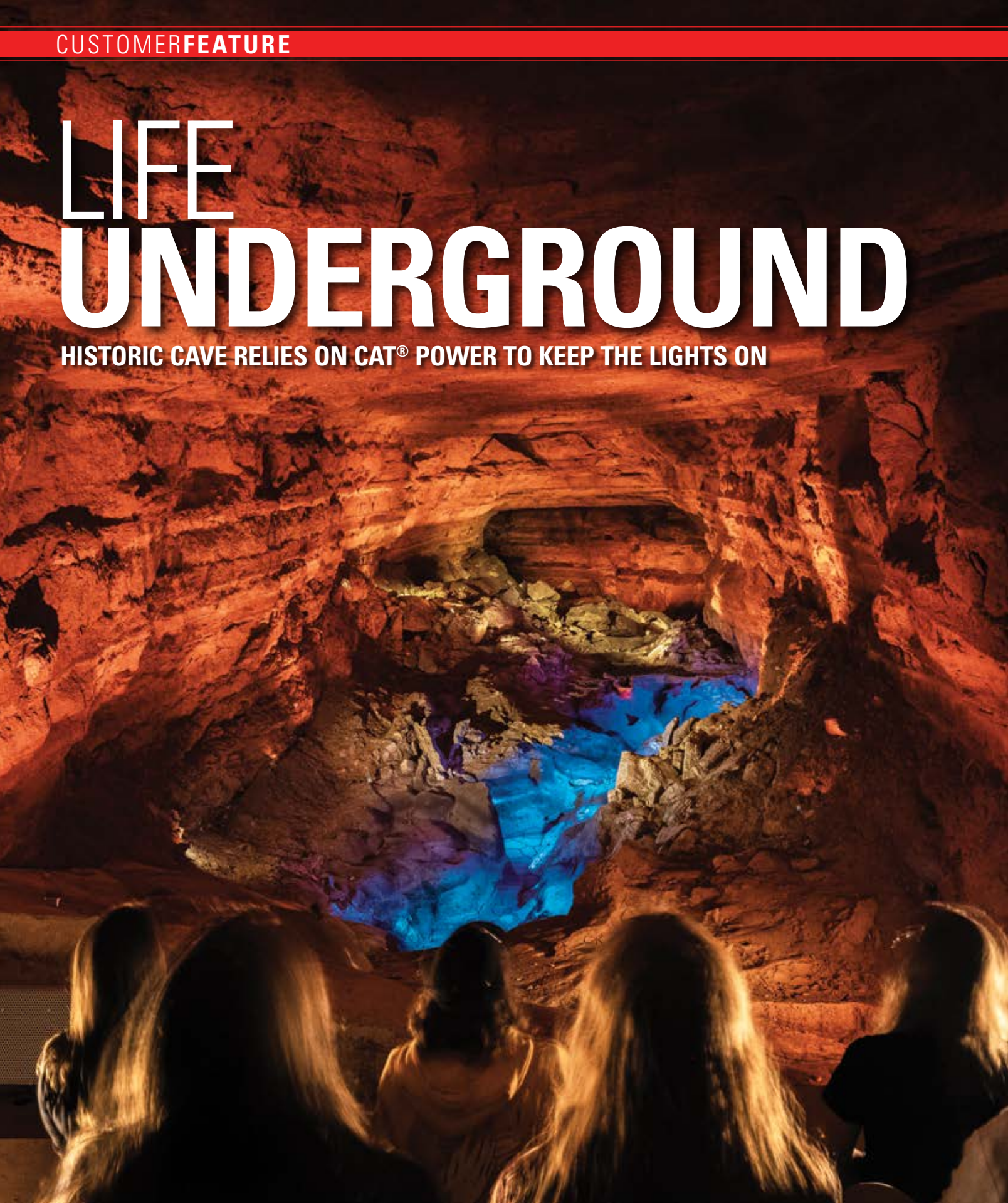
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LIFE UNDERGROUND

HISTORIC CAVE RELIES ON CAT® POWER TO KEEP THE LIGHTS ON



Discovered in 1960 by a group of local college students on a family-owned ranch in the Texas Hill Country, today Natural Bridge Caverns is one of the world's premier show caverns.

At the attraction north of San Antonio, visitors go underground and explore different layers of limestone that likely formed during the Cretaceous Period when a warm shallow sea covered much of what is now Texas. Over millions of years, underground water dissolved the limestone and hollowed out the wondrous passages at Natural Bridge Caverns.

Designated as a State Historical Site, National Natural Landmark, and listed on the National Register of Historic Places, Natural Bridge Caverns derives its name from a 60-foot natural limestone bridge located above the entrance to one of its caverns.

The family owned and operated natural wonder features multiple tour experiences through two distinct caverns that each extend for one-half mile. Natural Bridge Caverns offers a selection of tours, including the Discovery Tour, the Hidden Wonders Tour, and Adventure Tours.

"We are a unique gem here in the San Antonio/New Braunfels market," says general manager Terri Adams. "When people bring their kids here or they come on their own, they realize how important and fun it is to go into a cave. And from a staff perspective, we have a unique employee culture where everyone buys in—conservation and being good land stewards are important to us."

In May, a multi-million-dollar tour experience featuring state-of-the-art lighting, a sound and light show and expansion into the southern Hidden Cavern will open to the public. Development of the new half-mile long Hidden Wonders tour and opening new areas of the cavern have been underway since 2017.

"The Hidden Wonders Tour will showcase this cavern like never before," said Brad Wuest, president of Natural Bridge Caverns. "Many people don't realize we have two distinct caverns available to tour—our Discovery Cavern and the Hidden Cavern. The Hidden Cavern is a unique environment

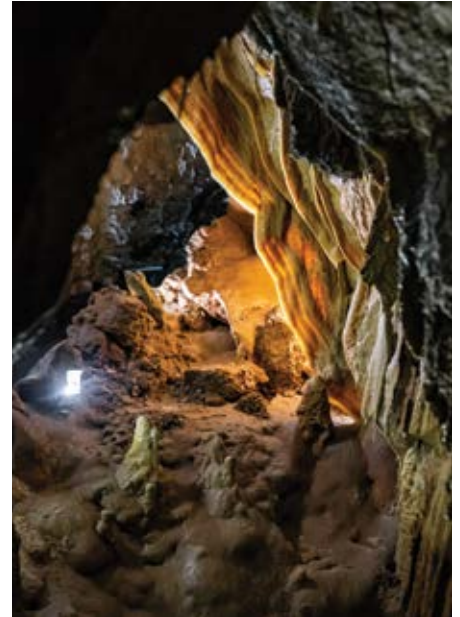
which never had a natural opening to the surface. As a result, incredibly delicate and beautiful formations were able to grow in a completely sealed environment."

New lighting is one of the dramatic changes in the cavern, with 3,366 lights and five miles of cable installed for WiFi, communications and light control. A 1,100-foot-long expansion of the public passageways through the cave enables guests to tour through an area that was only previously accessible by cavers. Throughout the tour, guests will find "discoverable moments" consisting of special lighting on features that are unusual or of particular interest.

The new addition showcases an underground canyon, more formations, and a large 5,700-square-foot dome chamber called the Ballroom, which can serve as an event space. A new viewing area overlooking a massive passage called the Box Canyon serves as a natural theater for a new sound and light show.

Exiting the Hidden Wonders tour, guests can effortlessly ride to the surface on a 700-foot long Belt Assisted Transport (BAT) through a newly constructed exit tunnel. The BAT is the world's first ride-out conveyor system installed in a cavern.

An exit plaza and pavilion designed to blend into the karst landscape provides a comfortable transition for guests emerging from the subsurface, with soon-to-be-added amenities including souvenir photographs, food and drinks. Altogether, these innovative features deliver a completely new experience at the historic National Natural Landmark.



Keeping the lights on

Given that many guests are on the Hidden Wonders tour at any given time, keeping the lights on is critically important. Because Natural Bridge Caverns is positioned at the end of a utility line, in the past power outages were not uncommon. While upgrades to the transmission system have made grid outages far less frequent, they can still happen.

Continued on page 6

“I think a lot of people have some apprehension about going underground into a cave for the first time,” says Justin Royce, cavern development director. “They don’t want the lights to turn off and be stuck in the dark. And we definitely see a little bit of relief when I tell them that we have Caterpillar generators that’ll automatically start up and keep the lights on if we lose grid power.”

A new Cat® D200 GC standby generator set is the latest addition to Natural Bridge Caverns’ fleet of five Cat gensets. It backs up 60 percent of the expanded Hidden Wonders tour, while another genset provides standby power to the remaining 40 percent.

“We have a history of using Cat generators here, so it was really easy to decide that the next one we purchased was a Cat unit,” Royce says. “It’s the size that we needed, and we’re familiar with everything on them, not to mention the reliability factor.

“Before we open the Hidden Wonders experience to the public, it’s essential that we have a backup power solution installed and ready to go,” Royce adds. “During our busiest periods, we can have multiple groups in the cave, each taking these hour-long tours. The last thing we need is to lose the lights and power to other systems.”

Natural Bridge Caverns also features above-ground attractions, including two ropes courses for adults and



kids, a climbing tower, maze, as well as restaurants and shopping.

“This is a large working ranch, and we operate like our own little city here—we have ongoing construction, maintenance and operations, grounds, landscaping, human resources and accounting functions,” Adams notes. “So with everything we have going on here, it’s important to keep the power on.”

Adds vice president and co-owner Travis Wuest: “Being able to provide safety and have power and keep the lights on is the most important thing for our guests. But from a business interruption standpoint, our enterprise depends on power to operate ticketing systems and maintain point of sales, so we can’t afford to lose power.”

Natural Bridge Caverns is open 361 days a year, and downtime from power outages is not only a safety issue for guests, but can also result in lost revenue.

“If they have an issue and a technician is needed here immediately, having a Customer Value Agreement (CVA) with our dealership enables Natural Bridge Caverns to have a technician on site usually within a matter of hours, if not minutes,” says Ryan Stoughton, a power generation specialist from Cat dealer Holt CAT.

Under the provisions of the CVA, technicians from Holt CAT perform all scheduled maintenance, conduct load bank tests and take fuel samples on all five Cat gensets at Natural Bridge Caverns.

Remote monitoring saves time

With Cat generator sets installed throughout the property, having the ability to monitor their ready-to-run status is important. Holt CAT Power Systems recently installed Cat Connect on all of the facility’s generator sets to enable remote monitoring.

CUSTOMER PROFILE

Natural Bridge Caverns

Location: San Antonio, Texas

Application: Standby power

Cat® Equipment: D200 GC, D175, D150, D40 and D30 diesel gensets



“I think a lot of people are apprehensive about going underground into a cave for the first time. They don’t want the lights to turn off and be stuck in the dark. And you definitely see a little bit of relief when I tell them that we have Cat generators that’ll start up and keep the lights on if we lose grid power.”

JUSTIN ROYCE, Cavern Development Director
Natural Bridge Caverns



Cat Remote Asset Monitoring (RAM) provides real-time alerts, including engine and electrical parameters, fuel level, and current faults. Notifications are sent via text message and email. The end user can also view a web-based dashboard that displays key status parameters on a smart phone via a mobile app.

“In the past, I’d have to drive around and check the generators periodically or wait for someone to tell me that they heard a noise out in the pasture and have me go and check it out,” Royce says. “Now with Cat Connect, it saves me from driving around to check on all the units. I receive an alert on my phone or an email to let me know if there’s a change in status on one of the generators.

“With all the various activities we have going on here, time is precious, and checking fuel levels is a mundane task,” Royce continues. “Until recently, I’d have to run over and check the fuel gauges. But now with the mobile app, I

can also receive a fuel alert if any of the generators dip below 50 percent. So that alone is a real time saver.”

Reliable performance

All components in the 200 kW D200 GC generator set are integrated in a seamless package that provides optimum performance. The diesel-powered genset requires up to 18 percent less installed space. Each generator set package is tested before leaving the Caterpillar manufacturing facility, and is reliability tested to run for 500 consecutive hours. GC gensets come with a two-year warranty.

After the new D200 GC generator and automatic transfer switch (ATS) were installed by electrical contractor, Seguin Electric, Holt CAT sent a crew out to commission the genset, start it up and make sure the generator and the ATS were in sync.

“At the end of the day, the Holt CAT technician walked me through all the features of the new GC generator,

noting the differences between the Cat GC model versus the older Cat genset that we have on site,” Royce says. “And when he left, I felt comfortable being able to check the unit myself when needed.”

As the lead Holt CAT representative on the project, Stoughton credits the staff at Natural Bridge Caverns for deferring a D200 GC delivery to the San Antonio Zoo, which had a pressing need for a Cat GC genset to back up a new animal exhibit. Even though it had to wait a little longer for delivery of its generator, it was still ready in plenty of time for the opening of the Hidden Wonders Tour.

“Natural Bridge Caverns was incredibly gracious and gave up their 200 kW generator set that was on order so that the San Antonio Zoo could provide backup power to a new area,” Stoughton said. “They had to wait another five months to get theirs, but this is a quality organization, and we are always happy to help customers like Natural Bridge Caverns.”



NEW GAS GENSETS

FLEXIBLE FUEL UNITS PROVIDE RESILIENCY

New Cat® gas generator sets ranging in size from 20 to 200 kW will be available at Cat dealerships in North America through a staged rollout this year. The 15 new gensets are rated for emergency standby, demand response and prime operation, and enable customers to use a wide range of gaseous fuels in small 60-Hz applications. Designed for fast response and EPA-certified for emergency use, the generator sets are ideal for energy resiliency in small commercial businesses, industrial applications, and critical infrastructure such as freshwater and wastewater treatment plants. They are compatible with NFPA 110 Level 1 Type 10, and they are UL 2200 listed.


The units are also EPA-certified for use in non-emergency applications, making them ideal for demand response and prime power operation supporting microgrids, renewables and utility programs.

The natural-gas generator sets provide exceptional fuel flexibility by running on pipeline natural gas, propane and renewable natural gas.

Caterpillar's dual-fuel auto changeover technology enables users to connect both propane and natural gas sources to a single unit. The auto changeover technology utilizes natural gas as the primary fuel, and automatically switches to a backup propane tank when the supply of natural gas is interrupted. This capability provides resiliency that satisfies the requirement for a constant source of fuel.

“Caterpillar’s new generator sets provide owners of small enterprises with high-performing solutions offering fuel flexibility across an extensive range of power outputs—all backed by the expertise of the Cat dealer network,” said Retail Electric Power Solutions Vice President Jaime Mineart.

Hardware is pre-installed on the new generator sets to enable access to Cat Connect Remote Asset Monitoring, which provides data visualization, reporting and alerts through an easy-to-use web interface or mobile app. Available with a subscription, it enables operators and Cat dealers to track and manage generator set operation, identify potential problems, perform remote troubleshooting, manage operational expenses, and leverage long-term archives of site performance history to identify opportunities for further operational and system enhancements.

The generator sets include Caterpillar’s standard two-year warranty for emergency standby and demand response applications, with a suite of additional extended service coverage options available. They can be factory equipped with a steel or aluminium enclosure for superior sound attenuation, access for operation and maintenance, security and protection from the elements. 

To learn more about Cat gas generators ranging in size from 20 to 200 kW, contact our dealership.



FLIGHT PLAN

CAT® GENSETS PART OF AIRPORT SAFETY NET

As one of the fastest-growing regional airports in the Gulf South, Pensacola International Airport has seen double-digit growth in its passenger count over the last five years, handling 2.4 million passengers last year.

In 2022, the City of Pensacola launched a plan for a \$70 million concourse expansion project to provide more space for handling the airport’s rapid increase in passenger numbers and flights. Currently, the airport has one passenger concourse with 12 gates that was built in the early 1990s.

“The whole Gulf Coast region is really growing,” says airport maintenance manager Levi Treadaway. “We’re seeing more families moving here from many locations, and also

more industries are opening or relocating their operations to the greater Pensacola area.”

Disaster planning

Due to its location on the Gulf of Mexico, Pensacola is susceptible to hurricanes and tropical storms. Airport personnel receive emergency training as part of FEMA’s National Incident Management System (NIMS) and must be prepared to follow an emergency plan during hurricane season.

“Safety is a top priority for us,” says Byron Burkhart, assistant director of operations at Pensacola International. “We spend a lot of time training for emergencies—whether that’s a desktop exercise or a live exercise with first responders and even actors who play the parts of accident victims. Our emergency plan lays out a timeline that starts 72 hours before tropical winds

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CUSTOMER PROFILE

Pensacola International Airport

Location: Pensacola, Fla

Application: Standby power

Cat® Equipment: G3516B gas gensets (2), 3412 diesel genset, 480V switchgear





are predicted, all the way to landfall. We begin doing the smaller things like ensuring our equipment is fueled and functioning properly.

“Like we saw with Hurricane Ian recently, roadways were flooded, causeways were breached, and you couldn’t get in or out,” Burkart adds. “So, all the help—supplies and personnel—had to come in vertically by helicopter or plane. Often, airports become the hub of recovery efforts after an emergency or a disaster.”

Power to the airport’s passenger terminal is backed up by two Cat® G3516B gas generator sets, which are controlled by Cat Switchgear. The generators are housed in a standalone building located beneath the main concourse.

Pensacola opted for gas generator sets not only for a dependable fuel supply, but also to avoid having underground diesel fuel tanks located beneath the

“Cat® Switchgear came out and went through every breaker and tested them and did all the new wiring and made sure that we’re okay for the future. I’m constantly pushing to upgrade our systems here at the airport, and this one was a priority.”

MARK SWAIMS, Electrician,
Pensacola International Airport



main terminal and the planes that board passengers, Treadaway said.

“The odds of losing natural gas are really low, especially during times of hurricanes or severe weather because it’s all piped in underground,” Treadaway says. “With a dependable natural gas supply, we can fire up the generators instantaneously. They start quickly and

keep this airport operating during all kinds of weather events.”

During Hurricane Sally in 2020, the Cat gensets ran for 36 hours without interruption, said Mark Swaims, an electrician at Pensacola International.

“The generators started up at the beginning of the storm and they just kept right on going—so they’re very



dependable.” Swaims said. “Even when the passenger terminal shuts down in a severe storm, we need power to support critical airport operations that are housed in the main terminal building. We still have military search and rescue flights that come in and out. We have two helicopters and two airplanes running all the time that serve as medevac flights, so it’s critical.

The Cat gensets also supply seamless power during outages that can result from a downed power line or other non-storm related occurrences.

“There’s a short period where we ride through with a battery backup until the generators come on, and within about 45 seconds we are running at full load,” Swaims says. “And almost no one realizes that we lost power from the grid.”

Additionally, power at the airport parking structure is backed up by a Cat 3412 diesel generator.

System upgrade

Two years ago, the airport upgraded the control panels on its two Cat gensets. The EMCP 4.2 controllers provide all of the controls and system indicators in one easy-to-access interface.

Owing in part to a breaker failure that occurred during Hurricane Sally, Swaims opted for a switchgear upgrade that provides intuitive control, security, and access to real-time controls and information via a graphical, color touchscreen.

Cat switchgear and controls are designed to integrate with on-package,

microprocessor-based Cat engine controls. This integrated system provides greater efficiency and reliability in one package. All systems are designed to interface with building management systems. Control for multiple genset applications enables kW and kVAR sharing, load sensitive generator demand, and engine hour balancing.

“Cat Switchgear came out and went through every breaker and tested them and installed all the new wiring and made sure that we’re okay for the future,” Swaims said. “I’m constantly pushing to upgrade our systems here at the airport, and this one was a priority.

“When we did the switchgear upgrade, three experts from Caterpillar were here every night for 10 days. We worked from around 10 p.m. until 3 or 4 a.m.


We actually shut the airport down so they could do everything safely.”

Dealer support

Swaims starts the generators once a week to make sure they’re in good working order, and performs a monthly load test as the main terminal runs on generator power for an hour. He also conducts a detailed weekly inspection and maintains a detailed log.

Cat dealer Thompson Power systems conducts an annual inspection, which includes changing fluids. Swaims maintains regular contact with Thompson technician Jammie Haynes to address any issues as they arise.

“The other morning I talked to him twice and he was here all day doing some fine tuning,” Swaims says. “He always gets back to me right away and provides the information I need, or he comes out to the airport if we need him to address an issue. The bottom line is we have a good working relationship with Thompson. They’re always there when we need them.

“And it’s the same with Cat Switchgear,” Swaims adds. “If it’s specifically related to the switchgear, I have the personal number of one their field service team leads. So they’re both very helpful. This ensures that our standby power system is ready to run at a moment’s notice.” 



A CLIMATE OF CHANGE



NEW SCHOOL DEPLOYS CAT® MICROGRID



As the oldest high school on the West Coast with origins dating back to 1869, Portland's Lincoln High School was overcrowded to the point where some classes were actually held outside. With space at a premium in the 1952 era building, boys' basketball practices for 9th graders were held at 6 a.m., while dance team practices took place at 10 a.m. Ceilings leaked and the bathrooms had a persistent, unpleasant smell. Clearly, it was time for a fresh start.

As part of a lengthy planning process for building a new school, students raised money to travel to Finland and China to gain insight into world-class school designs. After years in the making, bonding for the project was approved in 2017. Last fall a new six-story, 289,000 square-foot state-of-the-art school opened to glowing reviews. The new \$242 million facility is 120,000 square feet larger than the old building, with a modern design that has open space for congregating and state-of-the-art classrooms that enhance learning.

The net result is a sophisticated urban campus that presents a creative model of restraint and economy of space while also maximizing design and functionality.

With its compact footprint, prominent exterior glass-wrapped stairs emphasize

the school’s vertical nature, projecting a sense of movement and energy outward from the school. Lincoln’s large glass-walled lobby, which doubles as a cafeteria dining room, looks out on a newly restored public right of way and community plaza. Flexible learning spaces on every floor cultivate social hubs and intersections for collaboration. Floor-to-ceiling windows and east/west views strengthen students’ connections to the active urban edge and also to the mountains and hills beyond.

“The whole project exceeds my expectations,” said principal Peyton Chapman prior to the school’s opening last year. “I just have so much excitement and pride.”

The State of Oregon requires all buildings that utilize public funds to dedicate 1.5 percent of the construction budget to alternative energy. The new Lincoln High campus includes a host of green features that reduce the school’s impact on the environment. The project is LEED Gold certified and includes a green roof to reduce solar heat gain and a photovoltaic (PV) solar array that generates almost 300 kW of power. The building makes extensive use of natural lighting and utilizes radiant floor heating in the main commons for high efficiency heating.

Building systems automatically dim the lighting based on the amount of daylight that comes into the building, resulting in substantial energy savings, says Erik



“The people at Peterson Cat are just so reliable and so easy to work with, and Caterpillar has a leading presence in microgrid applications.”

LAUREN KRUEGER, Senior Electrical Engineer, Interface Engineering

Gerding, senior project manager for the Office of School Modernization for Portland Public Schools (PPS).

“We’ve always been focused on trying to implement sustainable energy and recycling,” Gerding says. “It’s just part of the DNA in this region where we live. We were doing this long before the school district adopted a formal climate policy last year.”

Sustainable platform

The PPS Energy & Sustainability Office works to combat climate change by reducing greenhouse gas emissions in its schools and promoting resilient, inclusive, sustainable buildings and schoolyards. PPS has demonstrated a commitment to designing and constructing efficient green buildings.

So far, nine of its buildings have achieved or qualify for LEED (Leadership in Energy and Environmental Design) certification from the U.S. Green Building Council.

Last year, PPS adopted a broad climate policy that aims to mobilize resources for climate action, while educating and empowering students as leaders in the transition to a sustainable city and restorative society. A primary goal is to reduce environmental impacts and costs by designing and constructing new and renovated low-carbon schools that are energy-efficient, resilient, and adaptable. That includes utilizing renewable, non-fossil fuel energy sources such as solar, wind, and hydroelectricity.

Continued on page 14

CUSTOMER PROFILE

Portland Public Schools/Lincoln High School

Location: Portland, Oregon

Application: Microgrid/standby

Cat® Equipment: 660 PVC445 MP03 solar panels, Inverters (4), C9 & C13 diesel generators, Master Microgrid Controller, Cat Connect



“It’s a very overarching effort that calls upon every department in the school district to act swiftly on climate mitigation,” says Aaron Presberg, a PPS senior program manager for Energy & Sustainability. “In my department, our primary focus is reducing emissions because we work in buildings and operations.”

As part of its climate policy, PPS plans to reduce its greenhouse gas emissions by 50 percent by 2030—using the 2018-2019 school year baseline—and achieve net zero emissions by 2040.

Cat® microgrid solution

In designing this new world-class facility, engineers on the Lincoln High School project sought to incorporate sustainability and energy resiliency, ultimately contacting Cat® dealer Peterson Power Systems to devise a state-of-the-art solution. This consultation was based on Peterson’s

experience with photovoltaic systems and emergency generation applications, said Lauren Krueger, a senior electrical engineer with Interface Engineering.

“The people at Peterson Cat are just so reliable and easy to work with, and Caterpillar has a leading presence in microgrid applications,” Krueger said. “So I think we were pretty set on going with Cat components and Peterson Power Systems for their help and expertise in designing this project.

“Scott Posey (sales rep) and Eric Dappen (project manager) were both very helpful throughout the design process as we determined what we needed to specify, such as identifying the PV inverters that are compatible with the Cat microgrid controller,” Krueger said. “They helped us develop the whole design. They also assisted in conversations with the City of Portland to explain what we were planning and answering any questions, since it was a

unique scenario that the city hadn’t seen before.”

The final product is a Cat microgrid that includes a 278 kW solar array



and two Cat diesel generator sets (C9 and C13) that are all connected to a Microgrid Master Controller (MMC). The solar panels are net metered and send power back to the utility grid, for which PPS receives a credit on the school's energy bill.

The Cat MMC is the brains of the system, integrating both traditional and renewable energy sources to provide overall monitoring and control of the assets, thereby optimizing performance.

In the event of a grid outage, the two Cat generator sets serve as a source of standby power to run the school's critical loads. The C9 genset handles emergency loads and operates in parallel with the solar (PV) system. The EMCP 4.4 controller on the C9 connects to the MMC and the PV system. Meanwhile, the C13 provides standby power for life safety loads, but by code cannot be connected with a PV system.

"Before the rebuild at Lincoln, we opened several other schools in the district that have passive solar PV systems," Gerding says. "But with each project the technology evolved. So when we got to Lincoln, we started asking some different questions about the system and how it could be designed to incorporate renewable energy, while also providing standby power.

"If the generator has a 72-hour run time based on its fuel capacity, we can extend



"Our goal is to go beyond reducing emissions, by also making more resilient buildings to withstand climate events such as floods, wildfires, and extreme heat events. "If there's a grid outage, we have a backup system powered by the generators and solar panels that can operate critical parts of the building when there's no grid power."



AARON PRESBERG, Portland Public Schools
Senior Program Manager, Energy & Sustainability

that run time by utilizing the PV energy to take up some of that standby power load," Gerding says. "It's designed to run that way when the grid is down."

Loads backed up by the standby generator and PV load sharing include:

- Smoke control system
- Security and door actuators
- Domestic water booster pumps
- Elevators
- Freezers and coolers (including for medicine)
- Site lighting
- Motorized shades
- Motorized gates
- Building automation system
- ADA doors
- Wheelchair lifts

"Our goal is to go beyond reducing emissions, by also making more resilient buildings to withstand climate events such as floods, wildfires, and extreme heat events," Presberg adds. "If there's a grid outage, we have a backup system powered by the generators and solar panels that can operate critical parts of the building when there's no grid power."

For added reliability, the microgrid is outfitted with Cat Connect, which provides the ability to remotely monitor the status of the system. Cat Remote Asset Monitoring (RAM) provides real-time alerts, including engine and electrical parameters, fuel level, and

current faults. If there is an issue, notifications are sent via text message and email.

Taking action

One of the goals of the Portland Public Schools' climate policy is to ensure that staff and students learn about and engage in climate solutions and resiliency. The microgrid at Lincoln High School and ongoing energy efficiency initiatives at other schools in the district serve as tangible proof that PPS is taking action to mitigate the effects of climate change at the local level.

PPS offers extensive resources for students to learn about climate change, take initiative and get involved. Climate justice is offered as an elective course at the high school level in the Portland Public School District. Lucy Gragg, a climate justice vision project lead from McDaniel High, enrolled in the class.

"Sometimes people think of climate change as something that's out there and not really happening here," Gragg said during an online forum. "But when we started the school year last fall during the peak of the wildfires, I definitely appreciated the focus on local issues. It was really helpful for me and other students to gain a better understanding of the root causes and what we can do to help." 🌱

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