A Caterpillar® publication for Power Professionals WINTER 2021

RUNREADY™

POWERING A SUSTAINABLE FUTURE

LANDFILL A MODEL OPERATION

BEFORE THE STORM
Iowa hospital was ready for devastating windstorm

A PLAN FOR LIFE
Cat® D350 GC genset provides senior care facility with reliable power

CAT®

Ahead of the Curve

While the concept of sustainability and reducing greenhouse gas emissions has become a point of emphasis for both power producers and consumers in recent years, a New Jersey landfill operator is a shining example of doing things in a highly energy efficient manner.

The Cumberland County Improvement Authority is the only landfill in New Jersey to operate a microgrid, maintaining and operating its own electrical infrastructure. The microgrid enables the Authority to more completely utilize its own landfill gas to produce on-site energy.

Since 2008, The Authority has been converting methane gas from its 275-acre Solid Waste Complex in Millville, N.J., to 4.8 MW of electric power. The output supplies electrical energy to the entire facility, while excess power is sold back to the grid. The total annual economic impact of the landfill microgrid is estimated at $13.5 million. Other energy-saving initiatives at the landfill enable The Authority to control its own destiny, while dramatically reducing greenhouse gas emissions. *(To learn more, see the cover story starting on page 4.)*

Also in this issue, Caterpillar is moving ahead with a ground-breaking move to offer hydrogen-powered generator sets. In the fourth quarter of 2021, Caterpillar began offering the Cat® G3516H gas generator set specifically configured to operate on 100% hydrogen, including fully renewable green hydrogen, on a designed-to-order basis.

Building on 35 years of experience across multiple end-use applications, Caterpillar continues to improve the performance of hydrogen-fueled power technologies with minimal impacts on maintenance schedules and costs, availability, and operations.

This year-end issue also features a story about a hospital in Iowa that had both the foresight and the good fortune to install a new standby power plant in a reinforced structure six months before a devastating derecho windstorm ripped through, causing an extended grid outage and widespread destruction.

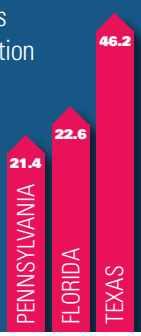
We hope you enjoy the issue. Thanks for reading, and Happy Holidays to you and yours.

DID YOU KNOW?

Texas produces more electricity than any other state, generating almost twice as much as Florida, the second-highest electricity producer. The Lone Star State is also the largest energy-consuming state, according to the U.S. Energy Information Administration (EIA).

Texas totaled more than 46,245,000 (46.2 million) MWh in net electricity generation for June 2021, the EIA state report shows. Florida was second at 22.6 million MWh, with Pennsylvania third at 21.4 million MWh.

According to EIA data, Texas also ranks first in production of crude oil, natural gas and wind power.



HYBRID ENERGY GOLD

Battery storage benefits African mine

Barrick Gold Corporation has collaborated with Cat® dealer Tractafric to install 7.5 MW of battery energy storage capacity for its microgrid at the Kibali gold mine in the Democratic Republic of the Congo (DRC).

Tractafric's solution deploys the battery energy storage and Cat® bi-directional power (BDP) inverters to provide grid stability, while the Cat Master Microgrid Controller (MMC) seamlessly integrates up to 45 MW of power generated by three hydroelectric power stations and 36 Cat 3512 diesel generator sets.

The Caterpillar grid stabilizer offsets the cyclical loading of the winding plant to reduce the spinning reserve requirement, which decreases annual diesel consumption by approximately 792,500 gallons, and the associated carbon dioxide emissions by an estimated 8,000 tons.

Located in the DRC province of Haut-Uele, the Kibali mine is one of the largest gold mines in Africa. Commissioned in September 2013, Kibali produced 808,000 ounces of gold in 2020 from integrated open pit and underground mining operations.

The hybrid energy solution adds to Tractafric's and Caterpillar's already substantial footprint at the Kibali Mine. Barrick uses 48 Cat haul trucks, blast hole drill rigs, wheel loaders, dozers, motor graders, wheel dozers, and water delivery systems at the Kibali Mine under a contract with DTP Terrassement-Kibali Mining Services. Additionally, Tractafric supports around-the-clock power plant operations and maintenance with an on-site staff of 18 technicians. Barrick also utilizes Cat Connect Remote Asset Monitoring for real-time collection and off-site monitoring of performance data.

"Improving the quality of power at a lower cost is a key business driver for customers," said Julien-Christian Chaumond, mining director and group sales director for Tractafric Equipment-Energy & Transportation. "The configuration of a power system featuring grid stabilizers illustrates how the technical expertise of Tractafric Equipment and the advanced Cat technology deliver sustainable hybrid energy solutions that supply cleaner and more stable power to customers, while reducing costs."

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IN THE SPOTLIGHT:

4 Sustained Yield

The Cumberland County Improvement Authority is the only landfill in the state of New Jersey to operate a microgrid, maintaining and operating its own electrical infrastructure. The microgrid enables the Authority to more completely recycle on-site energy from its own landfill gas, which fuels three Cat® G3520 generator sets.

FEATURES

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POWERING A SUSTAINABLE FUTURE

LANDFILL MAXIMIZES ECONOMIC VALUE, REDUCES CARBON FOOTPRINT

CUSTOMER PROFILE

Cumberland County Improvement Authority

Location: Millville, N.J.

Application: Landfill gas/waste-to-energy, cogeneration

Cat® Equipment: G3520 gas gensets (3)

Located 45 miles southeast of Philadelphia in southern New Jersey, the Cumberland County Improvement Authority's primary mission is to promote and develop the economic and environmental health of the region.

Nowhere is that approach more evident than at the county's 275-acre landfill in Millville, N.J., where it has developed a forward-looking Energy Hub that combines innovative, sustainable practices in one location. A microgrid powered by three Cat® G3520 generator sets is the backbone of the Energy Hub.

As a result of a public-private partnership, Allentown, Pennsylvania-based Energy Power Partners (EPP) owns and operates a 4.8 MW landfill gas-to-energy plant at The Authority's Solid Waste Complex. Three Cat G3520 gensets are fueled by methane gas from the landfill and produce approximately 20 million kilowatt-hours each year—enough electricity to power 1,600 homes. In operation since 2008, the project reduces annual emissions by 15,000 tons of carbon dioxide.

Electricity produced by the generators is primarily used to power all facilities at the Solid Waste Complex, as well as The

Authority's nearby offices. The remaining power from the waste-to-energy project is sold back to the local utility grid.

The Authority is the only landfill in New Jersey to operate a microgrid, maintaining and operating its own electrical infrastructure. The microgrid enables the Authority to more completely recycle on-site energy produced from its own landfill gas. The total annual economic impact for The Authority landfill microgrid is estimated at $13.5 million.

"We do not utilize taxpayer revenue; all of our operations are supported by fees that we collect," says Gerard Velazquez III, president and CEO of the Cumberland County Improvement Authority. "So the key is to be sustainable on the economic side, which is the tipping fees that we collect and other creative things that we do to generate the revenue that sustains us.

"The other part of the sustainability mix is how we can better accomplish our environmental goals," Velazquez says. "The ability to implement these programs while creating environmentally friendly and sustainable systems is integral to the ongoing operations of The Authority and its energy partners. So, sustainability is in our blood—it's what we do."

"Everything that we do here is designed to make landfill operations sustainable."

GERARD VELAZQUEZ, President and CEO, Cumberland County Improvement Authority

The Solid Waste Complex currently receives 540 tons of solid waste per day and operates 160 methane gas wells—this number will increase as the landfill expands. The greenhouse gas (GHG) impact of methane is up to 84 times worse than CO_2, so collecting and destroying this gas is important. Many landfills in the U.S. simply flare their landfill gas. The Authority saw the opportunity to use this gas beneficially to further reduce GHG emissions and simultaneously create economic value for the county.

"Trash is something that's going to be with us forever," Velazquez says. "So if you're in the trash business, the reality is you have to be a good environmental steward. For all of the things that we have going on here, there is zero impact. Not only are we all but eliminating greenhouse gas emissions, but there is virtually no odor coming from the landfill. When you pass the landfill and you don't notice the smell, that's a good day."

Cogeneration evaporates wastewater

In an effort to further maximize the efficiency of the microgrid, The Authority saw an opportunity to continue reducing GHG emissions while creating economic value. The waste heat

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from the generator sets is used to preheat the landfill leachate storage tanks and treat the leachate, which is the fluid that collects and is removed from the bottom of the landfill.

On average, the Solid Waste Complex treats 100,000 gallons of leachate per day (GPD) using a membrane technology called reverse osmosis (RO). However, the RO process creates 30,000 GPD of highly concentrated leachate that was trucked offsite to a location 40 miles away for disposal.

Working with Energy Power Partners, The Authority began a project three years ago to install a leachate evaporation system from Heartland Water Technology. Heartland's solution, called the Heartland Concentrator™, is a patented process that uses the hot exhaust from the power plant for evaporation, creating an energy-efficient cogeneration solution.

Before installation of the evaporation system, the exhaust heat from the generator sets was not beneficially used, notes Casey Cammann, a spokesman for Heartland Water Technology in Hudson, Mass.

"We were able to duct together exhaust from multiple engines and create a path of least resistance," Cammann says. "The system works on a negative pressure, so we're pulling the exhaust from the engines into the concentrator where it can evaporate the leachate."

By evaporating the leachate concentrate, The Authority eliminated GHG emissions and environmental risks associated with nearly 1,500 truckloads per year that were previously hauled offsite, saving the county thousands of dollars annually. Additionally, the combined reverse osmosis and evaporation system achieves a 98 percent reduction in raw leachate. Clean water derived from the process is collected in a large holding pond at the Solid Waste Complex.

Cat dealer Cleveland Brothers Equipment Co. played a key role in both the landfill gas-to-energy and evaporator projects. At the outset, the Cat generators and custom enclosures at Cumberland County were sourced through Cleveland Brothers during 2007.

The Cat dealer designed and built the hot gas duct system, new exhaust stack structure, as well as the containment pad. It also installed the Heartland Concentrator system.

Serving in the role of construction manager and general contractor, Cleveland Brothers also designed and built a jacket-water heat-recovery system, pump skid, and underground

pipeline that connects to the treatment plant. The heat exchanger uses heat from the Cat engines to keep the stored leachate warm enough to continue efficient water treatment throughout the winter by sustaining the biological process, and keeping the filtration process running at an optimum flow rate.

Controlling their destiny

The Authority's mission to sustain the environmental future of the county does not stop there. The Authority's Solid Waste Complex has an on-site public Compressed Natural Gas (CNG) fueling station and a fleet of eight CNG-fueled vehicles. CNG emits 50 percent less carbon dioxide than coal when burned. First opened in January 2019, the fueling station provides the opportunity for businesses who have made the switch to CNG to fuel their vehicles quickly and conveniently.

"The concept around the Energy Hub is taking everything that we do from an energy standpoint, bringing it in house, and essentially controlling our destiny," Velazquez says. "So, generating electricity with methane gas from the landfill and distributing it through our microgrid, along with treating the leachate and minimizing its environmental impact—everything that we do here is designed to make landfill operations sustainable."

Looking back, the original concept of waste-to-energy at the Cumberland County Solid Waste Complex utilizing landfill gas has evolved over time, and is likely to continue. Future plans call for creating an enterprise zone so that more businesses can use the power produced by the gensets. Another idea involves supplying energy to battery-charging power stations for electric vehicles.

"What was just a simple project focused on making electricity has today become a comprehensive energy hub for the residents of Cumberland County," says Steven Gabrielle, a partner with EPP. "The beneficial use at this complex has grown tremendously over the last decade under this partnership with The Authority."

ENERGY POWER PARTNERS

With about 50 projects from coast to coast in 17 states, Energy Power Partners (EPP) is utilizing more than 100 Cat® generator sets as part of its renewable energy portfolio. As is the case in many of its renewable power installations, EPP owns and operates the Cat power plant at the Cumberland County Solid Waste Complex.

"We've researched many different renewable technologies, especially when we started this business several decades ago. And clearly, Caterpillar was the premier engine then and remains so today," says Steve Gabrielle, a partner with EPP.

"Landfill gas is comprised of half methane and other constituents. And you need the right engine to properly destroy that gas and generate electricity. Through our research, we saw that Caterpillar had a very robust engine that could handle the biogas here at this landfill and other landfills where we have operations. There aren't a lot of manufacturers that have a product like that."

The president and CEO of the Cumberland County Improvement Authority concurs with that assessment.

"There are many landfills in New Jersey that are flaring their gas every day because their engines cannot hold up to carbon and the other elements that are part of landfill gas," says Gerard Velazquez III. "And those landfills are not utilizing Cat engines. When you take a look at what's happening throughout the state, the long-term performance of the Cat engines certainly stands out.

"We're very proud of our partnership with EPP, it's probably the best public-private partnership we have here," Velazquez adds. "It's a great way for us to utilize the strengths and capacity of a private entity to pull this project off. We benefit from the technical expertise and the operating knowledge of the private sector."

John Côté of EPP Service Company is the onsite plant operator at the Cumberland County Solid Waste Complex. He performs routine maintenance and conducts other tasks to keep the generators running 24/7/365.

"When I have an engine down for scheduled maintenance, our remaining units immediately come up to fill the gap," Côté says. "Overall, we have better than 98 percent uptime with these Cat generators."

Côté calls on the local Cat dealership when he requires additional technical assistance. He also utilizes Cat Electronic Technician (ET) software to diagnose existing and potential problems with the gensets.

"Cat ET makes things so much easier," Côté says. "I hook up my laptop, and the software tells me exactly what's wrong, and then I know what to do."

NEW ENCLOSURE FOR G3520H GAS GENERATOR SET

These sound-attenuated, factory-installed enclosures are designed for safety and Combined Heat and Power (CHP) optimization. Rugged construction provides weather protection and the ability to withstand exposure to the elements.

The CHP2500 is an enclosure standardized for natural gas-fueled Cat® G3520H engines rated at 2.5 MW, with generator rated for 4160V for CHP applications.

Cat gas generator sets simultaneously provide electricity for electrical loads and heat energy for a facility's thermal requirements.

For sound attenuation, this specially designed enclosure meets 75 dBA at 7 meters. The weather-proof enclosure is New Source Pollution Controls (NSPS) factory compliant, and Underwriters Laboratories (UL2200) compliant. The structure includes service and personnel doors, along with a separate electrical control room. Internal and external emergency stop buttons are placed at convenient locations.

Features & benefits

- Robust/highly corrosion-resistant construction
- Combined hot water and power generation
- Weatherproof Caterpillar white enclosure
- Zinc plated or stainless steel fasteners
- 22-gauge galvanized steel construction
- Pitched roof for improved rain ingress protection
- Internally mounted overhead crane with trolley for easy maintenance
- Externally mounted exhaust system (muffler, oxidation catalyst and heat exchanger)
- 75 dBA enclosure at 7 m
- Vibration spring isolators
- Roof mounted cooling system
- 120 MPH windload
- Motorized campers
- Integrated crankcase ventilation system (CCV)
- Integrated gas fuel train NFPA37 & CSAB149.3 with external fuel connections
- Oil makeup tank (50 gallon), waste oil tank (300 gallon / two oil changes), fresh oil tank (500 gallon /two oil changes + makeup)
- Interior AC lighting system and receptacles
- Optional cold-weather bundle, including enclosure heaters and ventilation recirculation

Security & safety

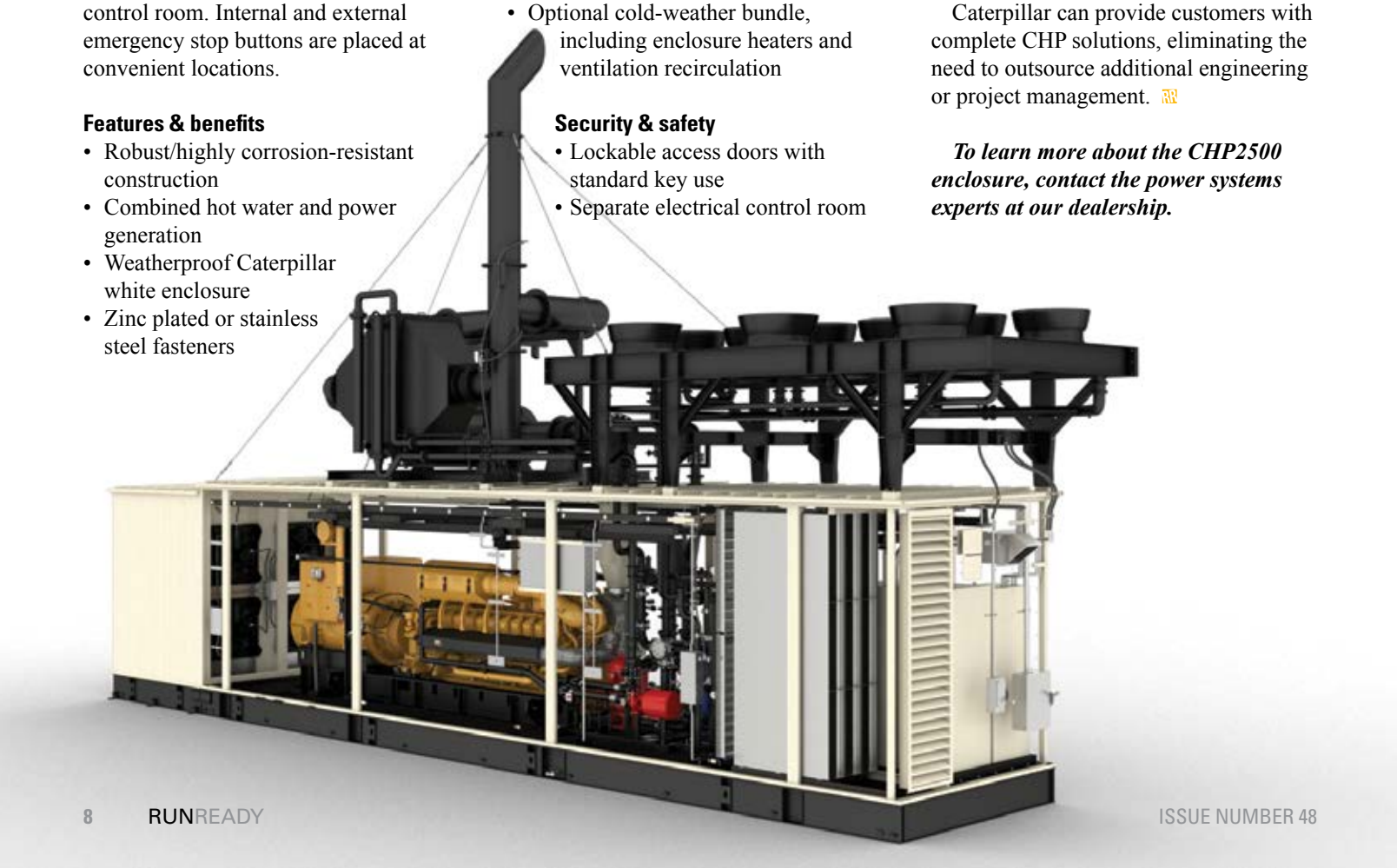
- Lockable access doors with standard key use
- Separate electrical control room
- Cooling fan and battery charging alternator fully guarded
- Oil fill and battery can only be reached via lockable access
- Externally mounted emergency stop button
- Designed for spreader-bar lifting to ensure safety
- Gas leak alarm
- Fire detection system
- Spill containment floor
- Optional: Fire suppression system
- Optional: Interior DC lighting system with automatic shutoff timer

Excellent Access

- Walk-in enclosure provides sufficient access for operators and technicians
- Cable stub up is easily accessible through the base floor
- Double doors on both sides
- Batteries recessed in base to improve maintenance access to the engine

Caterpillar can provide customers with complete CHP solutions, eliminating the need to outsource additional engineering or project management.

To learn more about the CHP2500 enclosure, contact the power systems experts at our dealership.



A PLAN FOR LIFE

CAT® D350 GC GENSET PROVIDES SENIOR CARE FACILITY WITH RELIABLE POWER

Based in Manchester, Connecticut, Arbors of Hop Brook is a Continuing Care Retirement Community (CCRC) life-plan community providing senior care in an environment that maximizes resident independence along the continuum of care.

The Arbors provides a lifestyle that offers attractive residential suites and all-inclusive amenities such as chef-prepared dining, housekeeping, transportation, 24-hour security and a full continuum of healthcare services—all provided on one campus.

A skilled nursing facility operated for two generations by the same family-owned management company is adjacent to the Arbors, enabling residents to easily transition from one facility to the next when needed.

"As an independent residential life-plan community, this is a place where an individual or a couple can reside in an apartment. But they're monitored and continually have access to a full continuum of healthcare," says Brian Liistro, a managing member of the Arbors.

"And if our residents have a health-care issue that requires a procedure or treatment at the hospital, they can come back to the Arbors and recuperate here. Or they can go right next door to Manchester Manor, which is a skilled nursing facility. If it's a partner situation, a husband and wife, it's very convenient for one partner to visit the other partner next door at Manchester Manor—we have our own transportation service.

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"Instead of living by yourself in a condominium or living at home alone, here you're with caregivers that are cleaning your apartment once a week," Liistro adds. "If you don't feel right or something's not right with you, there's a nurse on staff, including holidays. So any time of the year, any day of the year, you can receive immediate care here."

Staffed by 55 dedicated people, the Arbors includes a dietary unit, caregivers who are onsite, and a physical plant supported by an engineering department.

With a total capacity of 114 residential suites, the 130,000 sq. ft., four-story building recently transitioned to a highly efficient heating and cooling system. In the past, the Arbors operated with a chiller for cooling and condensing boilers for heating. However, during the transitional times of year, when temperatures can vary greatly, the system lacked the ability to quickly switch over to provide the necessary climate control.

"When we turned the chiller on, we would keep it on for the next six or seven months," Liistro says. "But with climate change and global warming, some days during the transitional weather months can be as warm as 80 degrees or the next week, it could be really cold," Liistro says. "So during the shoulder seasons, things are not like they used to be."

To better serve the needs of its residents, a new variable refrigerant volume (VRV) system was installed at the Arbors. A VRV is an all-electric system that uses next-generation heat pumps to provide space heating and cooling to building spaces, and is capable of serving multiple zones in a building, each with different heating and cooling requirements. VRV technology alternates the refrigerant volume in a system to match a building's precise requirements.

"The crucial piece here is that our residents have adequate heating and cooling anytime they want it," Liistro says. "Some 33 years ago when the building was constructed, the summers weren't as warm as they are now. We have to be cognizant as a senior care operator that the apartments are sufficiently cooled during the summer months.

"We're going through a heatwave right now as we speak," Liistro said in late August 2021, after the remnants of a Tropical Storm Henri passed through the area. "It's going to get extremely humid. If we lose power during a storm, our residents would be extremely uncomfortable if we didn't have clean, reliable power."

A new standby power solution

The new high-efficiency VRV heating and cooling system required a new backup generator with higher power output in order to ensure it continues to operate if grid power is lost.

"So we had to make sure that the emergency power was as clean or cleaner than the power we receive from the public utility," Liistro says. "Our mechanical and electrical contractors advised us to be extremely careful with regard to the backup generator we selected.

"After a thorough review by our contract engineers, they recommended a couple of equipment manufacturers backed by quality dealers with certified service teams who had training and field experience with their products, and we chose to go with Caterpillar."

The selection of a Cat D350 GC diesel generator set was driven not only by quality power considerations, but also by the unit's compact footprint. The D350 GC genset has a maximum power rating of 350 ekW, and requires up to 33 percent less installed space.

Also, the D350 GC genset weighs up to 19 percent less than comparable models, which means easier handling and less structural support is required.

Given that the new unit was installed in the same spot outside the building as the previous generator, it had to conform within certain size parameters to satisfy the local fire code.

"One of the main reasons that we went with Caterpillar is that they offered a more compact unit at the exact size we needed to support the heating and cooling system compared to a competing unit we were looking at," Liistro said.

Dealer assistance

The power systems division of Cat dealer H.O. Penn also provided engineering support.

CUSTOMER PROFILE

Arbors of Hop Brook

Location: Manchester, Conn.

Application: Reliable standby power

Cat® Equipment: D350 GC diesel generator set

ARBORS OF HOP BROOK
Life Plan Retirement Community

"H.O. Penn helped us with the design, and they verified the calculations that our electrical engineer provided," Liistro says. "They looked at the system demand—our electrical engineer had all of our electric bills and they evaluated them. But there was another layer of quality control—H.O. Penn reviewed the numbers to make sure the math worked. If there was a question, they were going to identify it before our generator was built to our specifications."

Liistro was familiar with Mike Thibault, a sales engineer with H.O. Penn who had called upon him many times in the past. Once the sale was complete, Thibault handed him off to H.O. Penn project manager Mike Gaudiello, who guided the rest of the process, including delivery, installation and commissioning.

"All through the process, he kept me informed about what was happening," Liistro says. "He was well organized and very capable. When it was getting close to delivery, he told me to go ahead and get a concrete pad poured and give it enough time to cure. Then he came out and measured it to make sure it was the correct size."

When the new Cat genset was delivered in May 2020, a team from H.O. Penn was waiting to handle the crane lift and the installation. Within less than 48 hours, the new Cat D350 GC generator set was commissioned and online.

"We have a great team here at the Arbors. But when you rely on this kind of sophistication with these generators, we let H.O. Penn take care of that—they're the experts."

BRIAN LIISTRO, Manager, Arbors of Hop Brook

Long-term service agreement

Components used in the D350 GC generator set are selected based on seamless design integration to provide optimum performance. The genset is fully assembled at a Caterpillar facility following quality guidelines, and each generator set package is tested before leaving the Caterpillar facility.

All generator maintenance is handled by technicians from the power systems division of H.O. Penn. The Cat generator at the Arbors is covered by a Customer Value Agreement (CVA), which offers resources for maintenance planning, repairs, rebuilds, and upgrades, along with diagnostic and troubleshooting support. A CVA also includes expert dealer advice and training options.

For added protection, Liistro opted for Extended Service Coverage (ESC), which provides coverage beyond the standard warranty period for parts and labor expense on covered components. An ESC helps to avoid unexpected costs caused by unscheduled repairs, and also budget for unexpected repairs while locking in costs up front.

"When you're delivering high quality health care in a continuing care or life-plan community, you need to have service contracts on everything—from refrigeration to your elevators to your backup generator," Liistro says. "If you have a high-quality machine and then it goes down for some silly reason, like a faulty emissions sensor, you need to be able to get on the phone and call for service.

"H.O. Penn is 30 minutes from us, and the service they provide is exceptional," Liistro continues. "We have a great team here at the Arbors. But when you rely on this kind of sophistication with these generators, we let H.O. Penn take care of that—they're the experts.

"We have an ultimate responsibility for taking care of our residents, so we want the best here. And we want the Cat dealer working on our standby power generator."

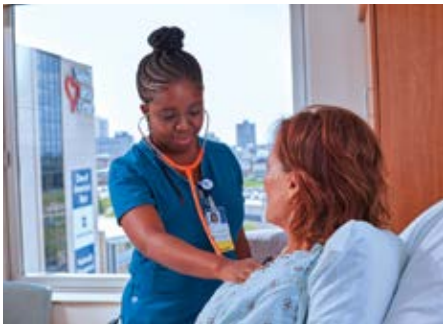
BEFORE THE STORM

Iowa hospital was ready for devastating windstorm

On August 10, 2020, a powerful derecho hit the city of Cedar Rapids, Iowa, packing wind speeds of 140 mph and causing widespread devastation throughout the community. The unprecedented straight-line windstorm lasted approximately 45 minutes and damaged every corner of the 75 square-mile city—causing an estimated $60 million in damage.

The derecho tore through Iowa's second-largest city just 12 years after a devastating flood caused $11.3 million in damage to Cedar Rapids in 2008.

Up to 100,000 trees were damaged or destroyed—representing more than 65 percent of the city's tree canopy. Decades-old trees that once lined streets and yards were sheared off or completely uprooted, making many city streets impassable.



Homes and businesses throughout the city were devastated. Alliant Energy and Linn County REC reported all Cedar Rapids customers were without power immediately after the storm. Traffic signals, roadway signage and other critical services were down. The city's water and wastewater treatment plants, police and fire stations, and local hospitals relied on generator power to maintain operations until grid power could be restored.

The city's largest medical facility, UnityPoint Health-St. Luke's Hospital, sustained significant roof, window and water damage. Additionally, UnityPoint Health fiber optic lines were destroyed by the storm, and significant debris and downed trees littered the hospital grounds.

When grid power was knocked out, St. Luke's operated solely on backup generator power for two days. Because the Urgent Care and Family Medicine Clinics were closed in the area, the St. Luke's Hospital ER treated a much higher volume of patients.

New Cat® power plant

Six months prior to the storm, St. Luke's commissioned a new 4.5 MW standby power plant consisting of three Cat® 3512 generator sets.

"From the get-go during the early design phase, there was no question that we wanted to go with Cat generators," said plant operations manager B.J. Schreckengast. "Based on our previous experience running Cat gensets, we were all in agreement—there was really no consideration given to adding another brand of generator."

St. Luke's has 16 operating rooms that are fully utilized from 12 to 16 hours daily. Procedures range from open heart surgery to hip replacements.

"So it's very critical that we maintain that emergency power, should our normal power source fail as it did during the derecho," Schreckengast said. "These critical areas of the hospital need to be up and running, and there can't be any doubt that the generator sets will fire up immediately and run continuously until grid power is restored. Our expectation is that they will be ready to run when needed, and we don't have to worry about it. And that was certainly the case last summer when the derecho hit and grid power was suddenly gone."

St. Luke's has 26 automatic transfer switches throughout the hospital that are fed from the generator plan. Two of them are dedicated to the chiller plant, which runs two 1,200-ton units.

"So it gives us cooling capability during the summer months that we previously did not have with our old generator plant," Schreckengast said.

Weathering the storm

Less than six months after the new generator plant was commissioned, the derecho struck Cedar Rapids.

CUSTOMER PROFILE

UnityPoint Health St. Luke's Hospital

Location: Cedar Rapids, Iowa

Application: Standby power

Cat® Equipment: 3512 diesel gensets (3)

UnityPoint Health
St. Luke's Foundation

Schreckengast knew bad weather was approaching, so he had the facilities staff start the generators in advance of the storm's arrival—a practice known as storm running.

"We were in the power room when it hit, and it hit hard," Schreckengast recalled. "It ripped off a good portion of the roof on the sixth floor and broke several windows. Trees were down and roads were completely blocked around the hospital campus. It seemed like it went on forever. When you think of a tornado in the Midwest, it comes and goes pretty fast. But this lasted for a much longer time."

St. Luke's lost both utility feeds to the hospital and ran on generator power

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"These Cat generators had maybe 50 hours on them before the storm. When they were asked to do their job, they performed perfectly."

B.J. SCHRECKENGAST Plant Operations Manager, UnityPoint Health-St. Lukes Hospital

for 38 hours until temporary utility power was restored. Schreckengast kept the generators running in case other intermittent outages occurred. The goal was to maintain normalcy for staff who were treating patients injured during the storm.

"These Cat generators had maybe 50 hours on them before the storm," Schreckngast said. "And they were asked to do their job, and they performed perfectly."

Ongoing dealer support

Regular maintenance on the gensets is conducted by facilities staff, while Cat dealer Altorfer Power Systems handles preventive maintenance on a periodic basis as part of a Customer Value Agreement (CVA).

"We have standards as a hospital that we have to follow, and some of those might be more stringent than what the manufacturer recommends," Schreckengast says. "So we work with Altorfer to make sure that we're meeting both our Joint Commission requirements from Medicare and Medicaid, but also that we follow Caterpillar's recommended maintenance procedures."

Whenever he has a question or a service need, Schreckengast says an Altorfer technician is quick to respond.

"Altorfer is great, I have multiple ways to contact them. Whenever we've called for service, it seems like by the time I hang up my phone and make my way up here to the plant, they're already pulling up outside and heading up here to take a look at any issue we might have.

"And they keep me informed about any new service recommendations," he continues. "With all big equipment that you want to maintain, there's obviously some things you always want to look out for. They keep me apprised of things we need to do to keep the generators in peak operating condition. In a word, the service they provide is outstanding."

The new power plant building, which is located next to the helipad off of the hospital's west entrance, won an award from Master Builders of Iowa for its overall design and integration into the existing facility. The structure is designed to withstand on EF3 tornado.

The seismically certified generator sets are mounted on a series of shock absorbing coil springs to minimize vibration. This is helpful in that magnetic resonance imaging (MRI) machines are located in an adjacent building, Schreckengast says.

"Early on in the design phase, there were concerns about how vibrations would affect our MRI machines with having these generators nearby," he says. "But we've had zero issues with that. We've had no complaints from the MRI staff, even when the generators run."

Currently, the generators need only run at 40 percent of their capacity to supply power to the hospital in the event of an outage. The third genset is required for redundancy should one of the other two gensets encounter a problem. It is also meant to provide additional power for future expansion of the hospital.

"So we do have a lot of room for future expansion on the campus with these Cat generators," Schreckengast says. "We expect them to last for 30 years. Hopefully, they will still be here long after I retire."

NEW 100% Hydrogen-Fueled Gensets

25% HYDROGEN-BLEND CAPABILITY ALSO ANNOUNCED

In 2021's fourth quarter, Caterpillar began offering the Cat® G3516H gas generator set specifically configured to operate on 100% hydrogen, including fully renewable green hydrogen, on a designed-to-order basis.

Initially available as demonstrator units in North America and Europe with deliveries beginning in late 2022, the Cat G3516H generator set will be offered with a rating of 1250 kW for 50 or 60 Hz continuous, prime and load-management applications.

These market-focused innovations leverage power generation projects currently operating on natural gas blended with up to 80% hydrogen to help address customers' carbon-reduction goals.

These high-performing, cost-effective technologies document the near-term viability of hydrogen as a prime fuel source. Building on 35 years of experience across multiple end-use applications, Caterpillar continues to improve the performance of hydrogen-fueled power technologies with minimal impacts on maintenance schedules and costs, availability, and operations.

25% Hydrogen Blends

Power generation solutions that can be configured to operate on natural gas blended with up to 25% hydrogen will be commercially available during Q4, 2021. Cat CG132B, CG170B, G3500H, G3500 generator sets—from 400 kW to 4.5 MW with Fast Response—will be included in the staged rollout. CG260 gas generator sets also configured to operate on natural gas blended with up to 25% hydrogen will be available for continuous, prime, and load management applications.

Additionally, retrofit kits that provide hydrogen-blending capabilities up to 25% for select generator sets built on these engine platforms will be available. Production of new natural gas generator sets and retrofit kits capable of 25% hydrogen blends will begin in the fourth quarter of 2022.

Looking to the Future

Plans for operating on 100% hydrogen include developing a range of commercially available new products, as well as upgrades for existing Cat gas generators. The development and launch of these solutions address potential end-user demand growth as the hydrogen-supply infrastructure matures.

These initiatives demonstrate Caterpillar's comprehensive, wide-ranging commitment to helping customers meet their climate-related objectives.

For more information, ***visit www.cat.com/sustainablepower.***

At Cat® Electric Power, we are striving for a world in which all people's basic needs—such as shelter, clean water, sanitation, food, and reliable power—are fulfilled in a sustainable way. We provide microgrids, combined heat and power (CHP), and low/no carbon-fueled power systems that enable economic growth through sustainable infrastructure and energy development.

Learn more at www.cat.com/sustainablepower

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