A Cat® Dealer Publication for Power Professionals FALL 2026

RUNREADY™



READY When The Water Rises

Cat® standby power strengthens wastewater treatment plant's resilience

DATA CENTER PLANNING
Navigating the transition from standby to prime power

TRIAL BY WILDFIRE
Cat® XQ2280 gensets help utility restore power in wake of natural disaster

Cleveland Brothers CAT®

FROM THE EDITOR

READY FOR WHAT COMES NEXT

Community resilience is measured by whether essential services continue when disruptions strike. That continuity depends on preparation, reliable equipment and people ready to act.

Two stories in the Fall issue of *RunReady* show how planning, equipment and expertise help communities stay ready.

In south-central Utah, Garkane Energy Cooperative serves a vast territory exposed to storms, wildfires and challenging terrain. After the Monroe Canyon Fire destroyed transmission structures last year, Garkane brought in Cat® mobile generators and worked with Wheeler Power Systems to prepare them for service. Temporary generation supplied customers while crews rebuilt the damaged system, helping maintain service during a demanding recovery.

Along the Des Moines River in Iowa, the Des Moines Metropolitan Wastewater Reclamation Authority is prepared for severe flooding. Historic floods have demonstrated how quickly rising water can threaten critical infrastructure and impact the wider region. Resiliency improvements include physical protection for essential facilities, elevated placement of electrical equipment and standby power generation to help preserve treatment operations when flooding conditions threaten normal access and power.

These investments support more than emergency response. Garkane's mobile units serve multiple purposes across its territory, giving the cooperative flexibility for planned work, outages and unexpected events. At the wastewater facility, flood protection strengthens the authority's ability to provide dependable treatment and protect public health, even as conditions change.

Resiliency is an ongoing commitment, not a single project or purchase. It requires organizations to understand risks, evaluate options and invest before an emergency makes those decisions urgent.



DID YOU KNOW?



RENEWABLES ON TRACK TO BECOME WORLD'S LARGEST SOURCE OF ELECTRIC GENERATION IN 2026

Renewables are on track to collectively generate more power than coal for the first time this year after reaching near parity in 2025, according to the International Energy Agency (IEA),

Today, the largest source of electricity generation globally is coal, followed by natural gas and hydropower. Solar PV, meanwhile, is expanding rapidly. In 2026, electricity generation from solar is set to increase by around 600 TW—matching 2025's record. As a result, solar is on track to become the world's second-largest source of renewable electricity generation this year, surpassing wind power.



ALWAYS GROWING: FLAVORITE'S GLASSHOUSE POWER STRATEGY

Flavorite, Australia's largest greenhouse grower, needed reliable standby power to protect crops, avoid disruptions and manage peak demand. At a key facility in Victoria, two Cat® C32 1100 kVA GC generator sets with advanced controls enable seamless transitions between grid and backup power.

With dealer support, remote monitoring, a Customer Value Agreement and a 10-year Extended Service Coverage warranty, the operation benefits from stronger uptime control and predictable energy costs.

The system was designed to support reliable standby power and enable smooth transitions from grid power to generator power during peak demand periods or outages.

For Flavorite, power reliability is directly tied to crop protection, product quality and day-to-day continuity. With more than 173 acres of greenhouse production across six facilities, even a short outage could put operations at risk and lead to major financial losses.

The new installation helps Flavorite manage peak demand costs and respond faster when grid conditions change. Backed by Cat dealer support and remote monitoring, the system gives the team more control and greater confidence in keeping operations running.

Beyond backup power, the system helps protect crops by maintaining stable conditions during outages and peak demand events, reducing the risk of disruption across a high-output growing environment. With reliable standby power in place, Flavorite can operate with greater confidence, running and growing the business and shifting focus away from energy concerns.

"Our standby system gives us real peace of mind, keeping our operations on track during peak demand and unexpected outages," says Chris Mills, COO of Flavorite Group. "It's an effective solution for managing energy spend, protecting our crops, and maintaining the quality our customers expect."

CONTENTS



IN THE SPOTLIGHT:

4 READY When The Water Rises

Serving 15 communities, the Des Moines Metropolitan Wastewater Reclamation Authority relies on Cat® standby generator sets and Ziegler Cat support to keep its facility operating during outages. Expanded standby power helps keep wastewater moving when severe weather strikes.

FEATURES







8 Data Center Planning
Navigating the transition from standby to prime power

10 Small Gas Generators
Power that delivers peace of mind

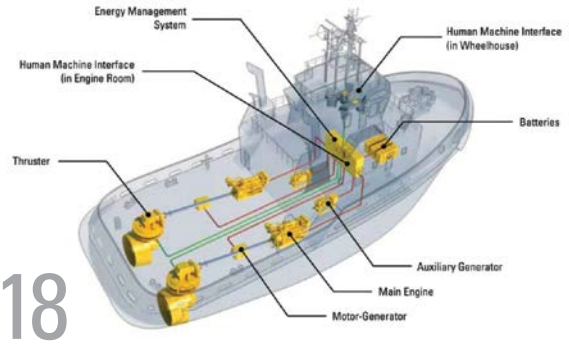
11 Stabilizing Force
Gas power helps operations stay reliable

12 Trial by Wildfire
Cat® XQ2280 gensets help utility restore power in wake of natural disaster

OIL & GAS AND MARINE SECTION

16 Cat® Smart Engine Management System
Optimizes Egyptian Drilling Company's operating costs

18 Cat® Powered Marine Hybrid System
Dramatically reduces operating costs



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READY When The Water Rises

Cat® standby power strengthens wastewater treatment plant's resilience

The rain did not let up. One storm rolled through the Des Moines metro area, then another formed behind it. By morning, up to seven inches of rain had fallen across parts of the Western Iowa region.

"The storms formed a train one surge after another," said Timothy Runde, treatment manager at the Des Moines Wastewater Reclamation Facility (WRF). "Every hour or so, another surge swept in."

On an average day, the plant processes about 65 million gallons of wastewater. The sustained storm flow produced nearly 212 million gallons. Operators worked through the night to keep water moving through the facility while collection-system employees monitored the network's feed.

The plant's two utility feeds remained available, so its Cat® standby generator sets were not called on to run. Even so, the storm provided a vivid example of why they are in place ready to run. Heavy rain is precisely the reason WRF cannot afford to lose the pumps, blowers and controls that keep wastewater moving and treatment processes functioning.

The Wastewater Reclamation Authority operates the facility and regional conveyance system serving 15 Des Moines-area communities. Combined sewers in downtown Des Moines can send dramatically more water toward the plant during heavy rain. The WRF is being upgraded to handle 300 million gallons per day, with an eventual goal of 400 million.

"We have an operations crew here 24/7 managing that, making sure the water continues to flow through the facility," Runde said. "In situations like the one we encountered during September's heavy rain, the hardest thing we do is getting our team members in here."

CUSTOMER PROFILE

Des Moines Wastewater Reclamation Authority

Location: Des Moines, Iowa

Cat® Equipment: G3520 Gas Generators (2), Switchgear (15kV)

Cat Dealer: Ziegler Power Systems

Water must keep moving

Like most wastewater plants, the WRF occupies low ground. Wastewater flows downhill toward the facility, where the main headworks lifts it once before gravity carries it through much of the treatment process. Pumps move additional flows between processes, but the headworks provides the critical first lift.

The plant's blowers are equally important. The 2,000-horsepower electric units deliver air to microorganisms in the aeration basins. Those organisms consume material in the wastewater and perform much of the biological treatment.

"We like to joke sometimes that we're just bug farmers," Runde says. "We give them food, give them a place to live, give them what they need, and they do the rest of the work for us. Without those bugs, we don't have treatment capacity."

The stakes extend far beyond the plant fence. If incoming wastewater cannot move through the system, it has to go somewhere else.

"Either the sewer is coming to our plant or it's filling up somebody's basement or overflowing out onto the streets," says Melissa Schlickbernd, a facilities engineer at the WRF. "It's very critical that the sewer functions the way that it's supposed to."

Runde puts the consequences in similarly direct terms. Sewers can hold only so much before wastewater escapes into streets, yards, homes and businesses. A long outage could also silence the blowers and destroy the microorganisms the plant depends on. Operators could reseed the basins from another facility, but rebuilding the biological process could take months.

The Cat emergency power system is designed to preserve the plant's most important functions. Supported loads include 700-horsepower pump motors, the 2,000-horsepower blowers, nine 200-horsepower return activated sludge pumps, disinfection equipment, process controls and essential building systems.

Continued on page 6



> **"Knowing these units are here, well maintained and ready to run when we need them is a huge relief."**
>
> **TIMOTHY RUNDE**
> TREATMENT MANAGER
> Des Moines Wastewater Reclamation Facility





Lessons from historic floods

Flooding is not an abstract threat in Des Moines. Major floods struck the region in 1993 and 2008. The WRF's levee held, but in 1993, flooding inundated the levee protecting Des Moines Water Works, knocking the city's drinking-water treatment plant out of service.

The Des Moines River borders the WRF and can rise quickly. Flood studies therefore influenced both the location and elevation of Building 73, the dedicated electrical switchgear and generator facility. The building sits above the 100-year flood elevation and at least a foot above the level identified in the project's flood analysis.

"It's not just a flooding issue," Schlickbernd says. "Electrical outages are also a concern."

The improvement project addressed both risks. Aging outdoor switchgear was brought inside. Transformers that once sat near ground level were raised five or six feet. A self-deploying floodwall was installed around the main headworks, where losing the ability to pump incoming wastewater would immediately threaten plant operations. Instead of assembling a large crew to place temporary protection, an operator can simply deploy the wall with the push of a button.

4 MW, with more to come

Building 73 currently contains two Cat G3520 generator sets and an adjacent space with Cat Switchgear. Each is driven by a 20-cylinder genset rated at 2,000 kW, providing 4,000 kW of standby capacity. The units were installed during 2022 and have accumulated approximately 90 operating hours apiece, most of them during scheduled system testing.

The selection process drew on input from WRF maintenance personnel, consulting engineers and equipment suppliers. Because the plant operates under a Title V air permit, the project also had to account for emissions requirements. Schlickbernd said the WRF weighed its history with several generator manufacturers along with the service available after installation. Past experience had made plant personnel certain about which alternatives they did not want. Cat gensets and switchgear and Ziegler Cat support emerged as the preferred combination.

The generators are dedicated to standby service. If both utility feeds are lost, they start automatically and begin supplying power in roughly a minute to a minute and a half. The raw-water pumping system in Building 05 is the first major load restored.

During the recent overnight storm, the availability of either utility feed meant the generators weren't required to run. Had both feeds failed, the outcome would have been much different.

"The Cat units would have started, and we would have been able to get our main pumps back up," said Chris Holsinger, a power generation specialist at the WRF. "It would have bought us some time to get through the storm."

The existing units can remove 4,000 kW of load from the plant's A bus. Two additional Cat G3520 units that will be installed within the next several years can support

another 4,000 kW on the B bus. Total standby capacity will reach 8 MW, enabling the WRF to carry the plant's full load in island mode.

The expansion also will support a new effluent pump station. During high river levels, gravity alone may not discharge treated water from the site. The station will help the plant move water out even when the river is pushing back.

Four matching generator sets will simplify controls, service and stocking parts, because common components can be used on any unit, Holsinger says.

For operators, the additional capacity will simplify decision making during an outage. Earlier systems required loads to be restored in a carefully managed sequence, so a large motor start would not overwhelm available power generation.

"Now, we have a lot fewer questions," Runde says. "Rather than explaining what you must start first because it has the highest demand, now it's simply: 'Start what you need to start.'"

Readiness requires practice

WRF personnel exercise and load-test each generator for 30 minutes every other week, varying the load from roughly 1,000 to 1,500 kW. Daily rounds monitor batteries, coolant, oil and jacket-water heater temperature. Operators track alarms and temperatures through the plant's SCADA system.

The primary controls are in the building's power distribution center, and the units also can be operated manually. The arrangement is straightforward to learn as well as teach, Holsinger said. Because the WRF is staffed around the clock, operators can recognize a problem immediately and quickly alert maintenance personnel.

"The generators start, run and do what they're supposed to do," Holsinger said. "They've been very reliable for us."

Four exhaust fans and two supply fans help keep the generator room near 85 degrees. In an adjacent room, Cat Switchgear is housed in an air-conditioned space. The switchgear can control the electrical loads of the entire plant and can be operated from a separate HMI screen in a control room located adjacent to the main switchgear space.

Ziegler Cat supported the project with technical documentation, commissioning, load-bank testing and training. Training was very important to the WRF staff, Schlickbernd said, because even experienced electricians need familiarity with new controls before an emergency occurs.

"In the heat of the moment, you need to know what you're doing instead of trying to look up how to operate the controls," she said.

Holsinger contacts Ziegler Cat when plant technicians encounter an issue they cannot resolve. With parts nearby and technicians responding quickly, the dealer helps maintain equipment that may sit quietly for long periods and then be called on to carry a major load without warning.

Resilience that works quietly

Standby power generation is only one part of a broader resilience strategy. New utility feeds provide more capacity than the previous lines. If one remains available, it can carry the plant while the other is out.

The WRF also recovers biogas from its digesters, cleans it through a pressure-swing adsorption system, and sells it into the natural-gas pipeline.

For Runde, the engineering ultimately supports something more basic: protecting water quality and the communities that depend on it. He can look at the water leaving the plant and see the result of the work performed by operators, equipment and the biological process they manage.

Building 73 may remain quiet through most storms. That's not a sign the investment is unnecessary. It means the utility feeds held, and the first layers of resilience did their job. If both feeds fail during the next major storm, the Cat generator sets provide operators with another way to keep water moving, Runde says.

"Knowing these units are here, well maintained and ready to run when we need them is a huge relief."





DATA CENTER PLANNING

Navigating the transition from standby to prime power

Are your energy needs expanding beyond just standby power? Here's what you can do.

It's safe to say the energy landscape is changing—the most prominent and significant changes have taken place in the last 24 months. The data-driven society we live in, from streaming devices and smart appliances to AI processing, continues to propel demand for data centers in just one rapidly ascending direction: up.

As data centers experience this growth, utility power is no longer a given. Today, there's no guarantee the local power grid can meet your increased needs. In fact, many utilities say it'll be three to five years (or longer) before they can bring the required amount of power online.

That puts data center customers in an uncertain position. How can they continue to expand and grow if there isn't enough power, and site relocation isn't an option?

The answer includes rethinking power options, and that means considering the transition from using power assets for largely backup purposes to employing them as a primary power source. That's a big change from the status quo.

If you're in a similar position, here's some advice to help you navigate the transition.

1. Bridge The Gap

First things first: if you need power quickly, and your utility cannot provide it, you should be considering a "bridge to grid" solution. This refers to "bridging the gap" until the local grid can provide sufficient power. These solutions can be made up of multiple power generation assets—including diesel and natural gas generator sets or turbines.

The beauty of a bridge-to-grid option is that it takes only a matter of weeks to install and can remain in place for weeks, months or even years. That enables you to set up or expand a data center operation, address growing power requirements and ensure reliability in places you wouldn't have been able to do previously.

2. Consider Your Emissions Requirements

Switching from standby to prime power requires you to run your power generation assets more frequently, and that can

affect your site's overall greenhouse gas (GHG) output—a challenge for data centers tasked with meeting evolving 2030, 2040 and 2050 sustainability goals.

To support your sustainability journey and reduce GHG emissions, you can:

- Add (or retrofit) a Clean Emissions Module (CEM) to your diesel generator set to support Tier 4 emissions compliance, including reduced particulate matter and NO_x emissions.
- Run your generator sets on biofuels, 25% hydrogen gas blends, or even 100% hydrogen.[1]
- Install microgrid solutions where possible, maximizing your use of renewable energy sources.

3. Make The Economics Work

Right now, your focus is likely capacity, but keep in mind that a power solution can be more than just a resiliency play. If you plan properly, it will benefit you economically, too.

For example, once your site is connected to the grid, what is your plan? One option is to transition your bridge-to-grid assets to a more traditional standby role and then install a distributed energy management system (DERMS) on them, which can save or even make money for your business.

With a DERMS in place, your power generation assets will be automatically dispatched when it makes the most financial sense, like during peak electricity usage when grid prices are at their highest. This helps your business avoid peak charges by reducing overall energy costs. Selling excess energy back to the grid is also possible. Either option can help you offset the initial capital cost of equipment while generating long-term savings.

4. Create Your Long-Term Plan

How do you address immediate needs without ending up in a similar situation a few short years from now? Answer: Plan 15 years out.

Create a plan that considers:

- **Site requirements:** Do you have space to expand? Do you have space for renewable sources?
- **Growth projections:** How much do you need to expand in the next 15 years? How much energy will you need?
- **Emissions reporting:** What are your emissions targets? How can you achieve them?
- **Overall landscape:** What local requirements might you need to comply with in the future? Do you have a contingency plan if that happens?

Planning for the future is a time-intensive process, but once completed your have peace of mind knowing that you should have enough power to see you through.

Whether you're data center is ready to make the switch from standby to prime power today, or simply weighing options for your next development or expansion, we have the depth of knowledge and experience to help you plan for the future. We'll work with you to find the right combination of assets and asset management software that fulfills your power requirements reliably and cost-effectively.

Contact our dealership to get the process started.

[1]Biofuels reduce life cycle GHG emissions in the fuel value chain; GHG emissions at the tailpipe are essentially the same as with traditional fuels. As compared to traditional fuels, hydrogen may have significantly reduced NOx and zero-exhaust greenhouse gas emissions at the tailpipe.





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CAT® INSPECT

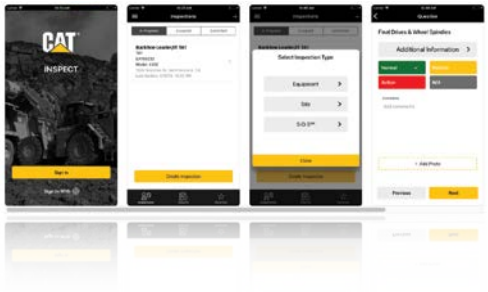
MAKE INSPECTIONS EASY, RIGHT IN THE PALM OF YOUR HAND

This easy-to-use application enables users to download and complete inspections and include additional information such as pictures, comments, and ratings. With engine-specific Preventive Maintenance (PM) checklists, performing recommended services at the appropriate intervals has never been easier. Never lose another paper inspection—complete and easily share your inspections electronically with Cat Inspect.

- Digital inspections provide real-time information for review, retention, and printing
- Secure inspection results for Cat and non Cat assets in one place
- Red, Yellow or Green ratings provide quick identification of actionable items
- Prioritize repair spend and budget based on inspection results and status
- Help screens available within the inspections provide applicable information
- Assign inspections and review results from various staff members
- Add ratings, make comments, and take pictures during inspections
- Integrate with other systems like VisionLink® for a big picture view of your installation

Simplify the inspection process

There is no cost to download the mobile app. The app is available for: Apple devices on iOS 10 and newer, and Android devices on version 5.2 and newer.



Watch the tutorial videos to get started using the Cat Inspect mobile app or Cat Inspect web at ***cat.com/en_US/support/maintenance/cat-inspect.html***

CAT® XQ2280

NEW LARGE-SCALE MOBILE POWER MODULE

The new Cat® XQ2280 power module is the industry's first single-engine mobile power solution above 560 kW that complies with EPA Tier 4 Final emission standards.

Now available for 60-Hz applications from Cat dealers throughout North America, the Cat XQ2280 power module provides up to 2 MW of standby power or 1825 kW of prime power. Its essential components are all packaged in a weather-resistant, 48-foot container that streamlines transport and deployment, while providing exceptional sound attenuation.

The XQ2280 is ideal for data centers, healthcare facilities, municipal infrastructure, wastewater treatment plants and other utilities, mining and quarry sites, and other large-scale applications.

"As the need grows for temporary power solutions that can support operations at an enterprise level, the XQ2280 proides superior prime and standby power performance in a complete, easy-to-operate package that meets North America's most stringent emission standards." said Tom Caldwell, global general manager for electric power rental solutions at Caterpillar.

Optimal performance

Powered by the field-proven Cat 3516C engine, the XQ2280 power module provides numerous features that make it ideal for rental applications. Equipped with the EMCP 4.4 digital control panel, it provides all generator set controls and system indicators in a single, easy-to-access interface, as well as programmable logic controller (PLC) functionality that improves reliability and flexibility for accommodating changes in processes or application requirements.

The XQ2280 power module is highly mobile for simplified site logistics, featuring external fuel and diesel exhaust fluid (DEF) fill ports positioned on the same side of the module for convenient single-side access. A new externally mounted touch-screen interface provides a safe and convenient way to monitor operating status and perform common tasks without entering the unit.

It is equipped with Cat Connect technology to remotely track and manage the generator set and improve operational efficiency. The telematics send real-time information on fuel level, DEF level, battery voltage, and run status. Connected assets support peak operation with timely insights that help customers better control costs, improve performance and reduce risks.

The XQ2280 power module is designed with a dual-wall, 1,050-gallon fuel tank that enables up to 10 hours of prime operation. An optional cold-weather package is available for operation in extreme weather conditions.

The XQ2280 can use up to 100 percent hydrotreated vegetable oil (HVO), a renewable fuel that can further reduce the carbon footprint of the engine and the environmental footprint of users. The mobile power module is also remote fuel- and DEF tank-capable for utility applications and continuous operations.

For additional information about the complete range of Cat rental power solutions, visit cat.com/rental power, or contact our dealership.

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AIR POWER PERFECTED

Need portable compressed air on the job? There's no better combination than a Sullair compressor and a Cat® C4.4 engine. You get reliable air flow, great fuel efficiency, quiet operation and easy service access.

For more than 50 years, Sullair has been on the leading edge of stationary and portable compressed-air solutions. The company was one of the first manufacturers to execute rotary-screw technology in air compressors, and now Sullair compressors are famous throughout the world for their legendary durability.

Industry leaders in over 64 countries use Sullair equipment every single day. These include companies in the medical, pharmaceutical, automotive, petrochemical, food and beverage, construction, rental, mining and power-generation industries.

Sullair compressor quality is supported by three important pillars: reliability, durability and performance. The engines that power the compressors are critical for upholding these standards, and that is why Sullair engineers chose Cat® engines. The Cat C4.4 engine powering Sullair portable air compressors delivers reliable air flow, fuel efficiency and quiet operation.

The Cat dealer network is another benefit to renting a Sullair air compressor, as the engines can be serviced quickly to minimize downtime.

Why Rent From Cat® Rentals?

Cat Rentals offers products in a wide range of sizes, configurations and capabilities. Our inventory includes power generation products like generators and engines to keep your jobsites and equipment operating at maximum capacity. We supply businesses in a wide range of industries with an assortment of energy rental equipment at affordable rates.

Besides our huge selection of top-quality equipment rental products at competitive rates, we'll help you set up a flexible rental arrangement that works for your operation. You can rent a machine or work tool attachment for a day, a week, a month or longer.

We'll also be there to provide reliable and fast repair and maintenance service whenever you need it. Professional on-site operator training is available as well so that you and your team can use the equipment as productively and safely as possible.

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RIGHT-SIZE YOUR GENERATOR SET

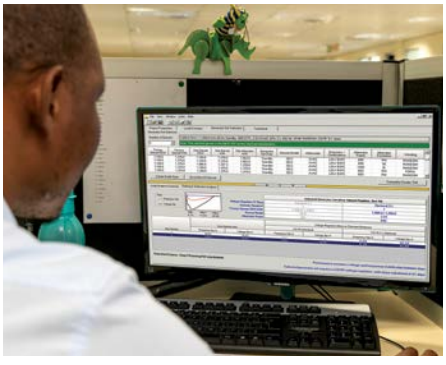
Considering factors such as site conditions, load characteristics and required performance, **Cat® Electric Power SpecSizer** provides accurate and timely technical data, robust load models and optimized algorithms to assist in specifying a properly sized generator set to best meet your power needs.

Reducing your sized genset lowers capital costs and can also lower installation costs, structural costs (including space and foundation), shipping costs and operational costs, as well as genset maintenance costs. For example, an oversized genset operated at lightly loaded capacity can be prone to wetstacking.

SpecSizer doesn't force an optimized genset selection, but calculates it along with a genset selection based upon your user-defined loads and load step sequencing.

Several new features set SpecSizer apart as a revolutionary tool in generator set sizing, including its ability to evaluate load types such as air conditioners, elevators, ultraviolet lights, single-phase NEMA and single-phase IEC motors. New loads have been added to SpecSizer, including fire pumps and transformers, and we're also preparing to release chiller loads. By expanding the load types that can be selected in SpecSizer, we are better able to assist you in identifying the generator set that best meets your needs.

SpecSizer offers a unique Application Wizard that collects data on the user's loads, then organizes the loads into steps, considering voltage dip and load demands, to assist in selecting the best generator set size in terms of both rating and footprint.



>> To learn more about many optimization opportunities possible when sizing generator sets with SpecSizer, you're invited to join our next webinar training session. For further information about SpecSizer training, email **specsizersupport@cat.com.**

SMALL GAS GENERATORS

Power that delivers peace of mind

Small natural gas Cat® generators, ranging from 20-750 kW, provide dependable and efficient backup power solutions tailored to meet your needs. From streamlined procurement to plug-and-play installation, you'll have reliable gas power that's code compliant, backed by 24/7 responsive support and ready to run.

Built for speed

A small natural gas generator set (20-750 kW) from Caterpillar provides reliable backup power with lower emissions, reduced maintenance concerns, and cost-effective solutions for consistent power during outages.

Keep projects on schedule

With immediate inventory and streamlined contracting (including government-approved purchasing contracts through Sourcewell and Canoe), we can help you bypass typical bidding bottlenecks and acquisition hurdles.

Gain quick access to energy

Caterpillar preconfigures its small gas generators for minimal on-site engineering. With energy installation made easy through plug-and-play designs, you gain quick access to the energy you urgently need.

De-risk ownership

Caterpillar turns a one-time purchase into a permanent commitment. Deliver assurance with 24/7 support from the Cat dealer network, continuous asset monitoring and 99% parts availability, along with extended coverage options for up to 10 years of worry-free maintenance.

Ensure a smooth inspection

Building codes and safety mandates can stall any project. Caterpillar pre-engineers its small gas generator solutions to meet strict NFPA 110, UL 2200, and local emissions standards, as well as hospital generator requirements. Eliminate the liability gap and ensure a smooth inspection with a solution designed to check every box automatically.

Small gas generator maintenance

Power is critical. Outstanding support is what makes it reliable. The difference between running and stopping comes down to how well a genset is supported. Regular maintenance helps gas generators stay ready for the moments that matter most. Even a small gas-powered generator needs planned upkeep to support reliable performance during power outages, helping extend the life of the unit.

With the right service approach, you can stay ahead of unexpected issues and keep your operations running. Cat Aftermarket Solutions are engineered for uptime and backed by the Cat global dealer network that responds when it matters most. From factory-trained technicians to strategically positioned parts inventory, we don't just promise reliability, we deliver it.

For expert assistance specifying Cat small gas generators, contact our dealership.



STABILIZING FORCE

Gas power helps operations stay reliable

There's plenty of innovation in today's energy landscape. Net-zero timelines, long-term planning and new technologies are all moving forward. They matter, but most organizations are focused on something more immediate: keeping operations stable and running reliably right now.

To narrow the gap between long-term goals and day-to-day realities, natural gas power is helping keep operations stay reliable while everything else shifts.

2026 realities vs. 2050 goals

Long-term targets shape strategy, but they don't remove today's challenges. Teams are managing:

- Unpredictable energy costs
- Pressure on supply reliability
- Rising expectations around uptime and performance
- Stringent regulatory norms

That's where gas continues to play a practical role. It's predictable and available when variability increases, helping bridge the space between what companies want to achieve and what they need to run. In practice, this looks like:

- On-demand generation during load swings
- Grid support alongside renewables
- Consistent performance when conditions shift

Energy as an operational advantage

Across industries, energy strategy is evolving. Instead of treating power as a fixed input, managers are looking at how they can strengthen resilience and performance utilizing:

- Decentralized and hybrid systems
- Intelligent load management
- On-site generation - including gas
- Flexible capacity that scales with demand

Natural gas can become a strategic tool. It enables fast response to demand spikes, continuity during grid interruptions and smooth integration with intermittent renewables.

The way you power your operations directly affects how quickly you can scale, and how well you handle disruptions.

Designing for stability

Weather-driven volatility, sector fluctuations and policy changes are reshaping today's energy environment. The steady state isn't guaranteed, and power systems need to reflect that.

That's why the industry is experiencing a rise in:

- Hybrid ecosystems combining renewables, storage and gas
- Modular generation that can be deployed quickly
- Digital controls that optimize across multiple sources

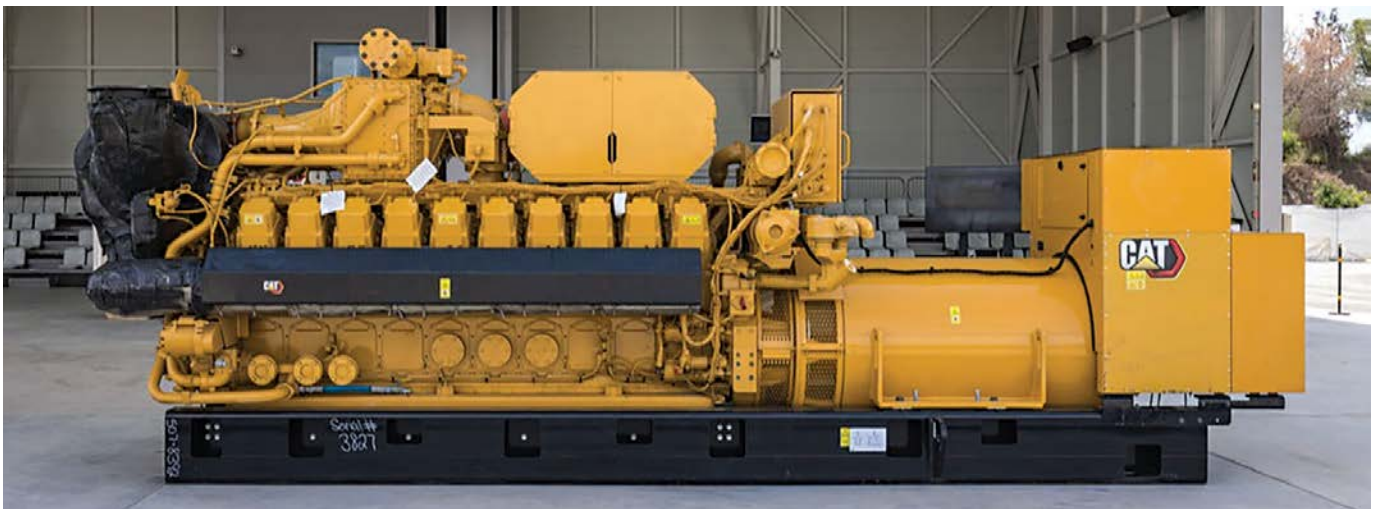
In this environment, gas plays an important stabilizing role, not the end state, but a reliable component that keeps the system balanced while everything else becomes more dynamic.

Bigger shift taking shape

All of this points to a larger change in how organizations think about energy.

"We're seeing a clear shift from energy as a utility to energy as a strategic asset," says Denzil Cotera, a business development manager for Cat Electric Power. "The organizations that recognize this early are the ones building resilience into their decision making."

It's not whether natural gas belongs in the future, it's how organizations use it to navigate the path forward. Those who build flexible, blended systems, where gas supports renewables, stabilizes variability and strengthens resilience are the ones positioning their organizations to move confidently through whatever happens along the way.





TRIAL BY WILDFIRE

Cat® XQ2280 gensets help utility restore power in wake of natural disaster

When the Monroe Canyon Fire swept through south-central Utah last summer, burning 73,721 acres over a 54-day span, Garkane Energy Cooperative faced the kind of emergency that can test even the best-prepared electric utility.

Firefighters battling the blaze reported that several of Garkane's transmission structures had burned and fallen. With access to the utility right-of-way restricted while the fire remained active, Garkane personnel initially had no way to determine the full extent of the damage—or how long some customers might be without electricity.

What they did know was that repairs would not be quick.

"We received a report from the firefighters on the front line that several of our transmission structure poles had burned down," says Garkane CEO Bryant Shakespear. "At that point, we knew several days of work would be required to make repairs."

Almost immediately, the cooperative began mobilizing crews, gathering poles, materials and equipment, and developing a plan to keep electricity flowing while repairs were made. Central to that plan were Garkane's Cat® XQ2280 mobile generator sets—and the ability of Cat dealer Wheeler Power Systems to quickly provide additional rental generators and experienced technical help.

The response ultimately enabled Garkane to replace the damaged structures without subjecting customers to an extended outage. It also demonstrated something the cooperative had not fully envisioned when it purchased its mobile generators: their value as a flexible emergency-response resource.

"This was probably the shining example of what you can do with these generators when things get tough," Shakespear says.

CUSTOMER PROFILE

Garkane Energy Cooperative

Location: Loa, Utah

Cat® Equipment: XQ 2000 Diesel Mobile Genset, XQ2280 Power Module (2)

Cat Dealer: Wheeler Power Systems

A rugged service area

Garkane operates in an environment where resiliency is more than an industry buzzword.

The cooperative distributes power from the grid to its members who are located in a sprawling, predominantly rural territory in south-central Utah and northern Arizona. Approximately 65 employees serve roughly 16,500 meters along more than 2,200 miles of distribution and transmission lines. The service territory encompasses about 16,000 square miles, only about 10 percent of which is privately owned. It includes both state and national parks, national monuments, national forests, a national recreation area, and extensive federal lands.

That makes the region visually spectacular—but particularly challenging for distribution of electricity.

Tourism is a major component of the regional economy, meaning reliable electricity affects not only Garkane members, but businesses serving millions of visitors. At the same time, mountainous terrain, winter storms, flash flooding and wildfires can make maintaining that reliability difficult.

Garkane designs its infrastructure with those realities in mind, including building structures to higher strength standards where appropriate and carefully evaluating overhead versus underground construction.

But geography makes another challenge unavoidable: Garkane cannot predict where the next major problem will occur. That's why mobile power generation is necessary.

Power that goes where it's needed

Garkane owns three Cat mobile generator sets: two XQ2280 power modules and an older XQ2000 module powered by a Cat 3516B diesel engine.

The generators perform several key functions. Garkane initially used mobile generation for voltage support in an area located at the end of a long line, where peak loading could create voltage fluctuation issues. The newer XQ2280 units were acquired in part to satisfy reserve requirements associated with Garkane's grid interconnection. Purchasing its own generating capacity eventually made more economic sense than continually purchasing those reserves during high-demand periods.

> **"This was probably the shining example of what you can do with these generators when things get tough."**
>
> **BRYANT SHAKESPEAR,** CEO
> Garkane Energy Cooperative



The units also give Garkane an important tool for handling extended outages.

"Given the large area that we serve, it's very hard for us to know exactly where the next problems are going to occur," Shakespear says. "Having a mobile unit just seemed to be the right choice for us."

Garkane has its own heavy-haul tractor and can move the generator sets along with step-up transformers, cables and associated equipment to a substation. Depending on the load, a unit can support a community of roughly 500 to 600 residences. For an extended outage, Garkane can mobilize the equipment and begin supplying electricity in approximately 12 hours—and potentially faster in a high-priority situation.

For a radial system covering such great distances, that capability represents a major change from the past.

Continued on page 14





Shakespear grew up in the area and remembers outages lasting a day or more while crews repaired the only line serving a community. Mobile generation now provides a much faster option.

"It can be the difference between having power or not having power for an extended period of time," he says.

Fire changes the plan

That difference became clear during the Monroe Canyon fire.

As soon as Garkane learned transmission structures had been destroyed, the cooperative began planning for what could have been a multi-day outage. In addition to mobilizing its own Cat generator sets, Garkane contacted Wheeler Cat about obtaining additional units from the dealer's rental fleet.

As conditions became more clear the following day, crews discovered they could make temporary repairs that would enable them to keep electricity flowing. That gave Garkane an opportunity to shift from an immediate emergency response to a carefully coordinated repair strategy.

"We realized repairs could be made in a more methodical fashion," Shakespear says.

Garkane positioned the mobile generators and worked with Wheeler Cat technicians to prepare them for operation. Crews assembled the poles, hardware and other materials they would need. Then, at a predetermined time, Garkane deliberately shut off normal grid power, started the generators and transferred the affected load onto temporary generation.

The result was twofold: customers continued receiving electricity, while line crews worked on de-energized infrastructure without simultaneously trying to preserve normal service.

"What that did was enable our crews to really respond and rebuild those structures without trying to keep the power on at the same time," Shakespear says. "It enabled them to do that in a much more expedited fashion."

The Cat generators operated for 14 to 16 hours, beginning about an hour before sunrise and continuing until roughly 8 p.m. Fuel tenders circulated among the units to refuel them as necessary. Once repairs were completed, Garkane took the generators offline and returned the primary system to its normal operation.

Wheeler Cat responds

The availability of generating equipment was only part of the equation.

When Garkane called Wheeler Cat that morning about additional rental units, the dealer responded quickly. Shakespear recalls making the call at approximately 10 a.m.

By around 5 p.m., Wheeler was mobilizing rental generators and sending them to the affected area. The rental units were identical to Garkane's own XQ2280 power modules. Just as important was Wheeler's technical support.

Connecting large mobile generators to a utility distribution system is considerably more complex than simply starting an engine and closing a breaker. Each circuit has different characteristics, and controls must be properly configured to maintain voltage and power quality, while protecting both the generator and the electrical system.

Wheeler technicians worked alongside Garkane personnel to configure and program the units before the planned outage.

"Once we got the generators set up and programmed, and we did that kind of before we actually took the outage, they ran," Shakespear says. "We didn't have any problems. They did what we asked them to do."

Shane Minor, a sales representative with Wheeler Power Systems, says Garkane's application is particularly demanding because the units can be called upon to operate under different control strategies.

"When you're islanding on a system, the controls have to act a totally different way than they act when you're paralleling with the grid," Minor says. "Those are two very different strategies, and they require people who are at the top of their game."

That technical capability reinforced one of the factors Garkane considered when selecting its mobile power equipment in the first place: dealer support.

"We really felt strongly about local support," Shakespear says. "We wanted to have somebody who had a presence in the area we already had a relationship with, which was what Wheeler Cat really provided for us."

Keeping communities operating

For the communities affected by the fire, the benefits were tangible and readily apparent.

Businesses throughout Garkane's territory depend heavily on visitors to the region's parks and recreation destinations. A prolonged outage could have shut down lodging, restaurants and other guest services. It also could have had far more serious consequences for residents relying on medical equipment, along with hospitals, grocery stores and other critical facilities.

The cooperative received kudos well beyond those directly affected by the outage. Shakespear says public officials and others who followed the response were impressed by Garkane's ability to maintain service under extraordinarily difficult circumstances.

"There were a lot of people who reached out and said thank you and were very appreciative of the work we did," Shakespear said.

"Garkane did everything possible, really miraculously, to get the power back on last night," Utah Gov. Spencer Cox told *The Salt Lake Tribune* after the blaze tore through a south central part of the state. "That was a lot sooner than anyone expected."

A new tool for resiliency

The Monroe Canyon response has changed the way Garkane views its mobile generation fleet. The cooperative did not originally purchase its two newer units specifically as wildfire-response assets. But the experience demonstrated how mobile power can be incorporated into future emergency planning.

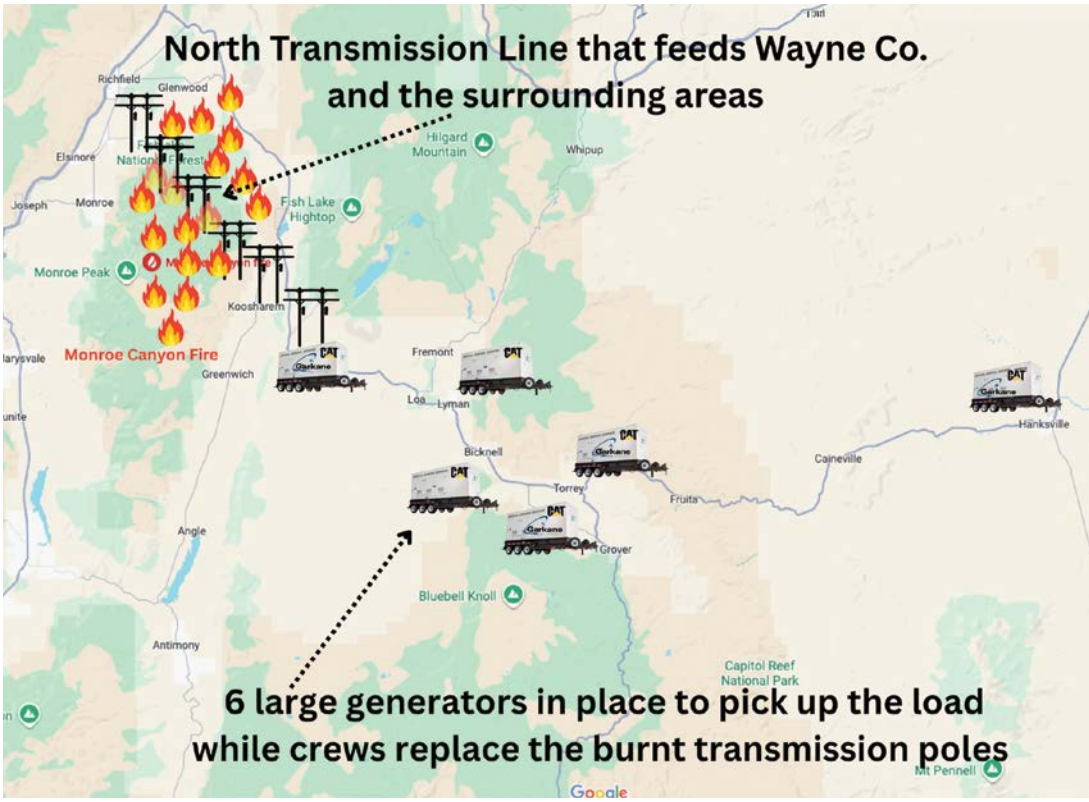
Garkane has since changed how it keeps the units prepared for deployment and is working to ensure mobile transformers can accompany them when needed.

The cooperative currently has no immediate plans to purchase additional mobile units. Instead, Shakespear expects Garkane will supplement its fleet with rental equipment from Wheeler Cat when an emergency situation requires more generating capacity.

For Garkane, the fundamental value of the Cat units remains straightforward: Provide electricity where and when the cooperative needs it. In a service area where a wildfire, flood, storm or landslide can suddenly isolate a community, that flexibility can turn what once might have been a day—or several days—without electricity into a much more manageable interruption.

And during the Monroe Canyon Fire, it helped Garkane keep its communities operating while crews rebuilt the system around them.

"These mobile units will continue to be an important emergency backup or an essential part of supplementing the grid," Shakespear says, "to ensure that we have reliable power when and where we need it."



CAT® SMART ENGINE MANAGEMENT SYSTEM



Optimizes Egyptian Drilling Company's operating costs

With the rapid advancement and modernization of developing countries, global power demand is expected to grow by more than 3.5% per year through 2030, according to a 2026 report by the International Energy Agency.[1]

Regions with vast and accessible oil and gas reserves—such as the Middle East—are primed to help meet rising energy needs. Increasing investment in upstream natural gas and boosting operational efficiency are part of a regional strategy to maximize oil and gas production.[2]

Successfully achieving that growth requires operators to seek automated solutions that not only satisfy production objectives, but also lower greenhouse gas (GHG) emissions and fuel spend—goals the Cat® Smart Engine Management System (EMS) is engineered to support.

Egyptian Drilling Company (EDC) operates a fleet of more than 70 rigs across Egypt, Saudi Arabia and Kuwait. The company sought Caterpillar's assistance to lower the operating costs and GHG emissions of Rig 78, the latest high-horsepower, deep-drilling asset in its fleet. EDC worked closely with its four-decade collaborator, Cat dealer Mantrac Cat, on a two-year project to implement the Smart EMS on the 2,000-hp newbuild rig equipped with three Cat 3512B gensets.

Together with Mantrac Cat, Caterpillar engineered a solution to provide integrated, field-proven hardware and robust digital systems to support EDC's operational and sustainability goals.

CUSTOMER PROFILE

Egyptian Drilling Company

Location: Egypt, Saudi Arabia and Kuwait

Segment: Cat® Smart Engine Management System (EMS)

Solution: Oil field drill rigs

Dealer: Mantrac Cat

Smart Engine Integration Improves Daily Oilfield Drilling Performance

Smart EMS is a valuable solution for Middle East operators as it helps reduce fuel costs, promotes longer drilling

engine life and lowers GHG emissions. It continuously monitors power demand and automatically adjusts engine operation in real time. When demand is low, engines are shut down; when demand increases, Smart EMS brings the engines back online automatically.[3]

The system is tailored to drilling-specific operating modes, such as tripping or back-reaming, enabling drillers to focus on operations instead of power management.

Continuously running the engines on a drilling rig is a costly and inefficient way to operate. As EDC sought to decrease fuel spend and engine run hours in its 24/7 operations, Smart EMS uniquely satisfied the operator's needs as the system can reduce engine runtime up to 25%, fuel consumption up to 10%, and improve diesel displacement up to 15%.[4]

These gains are possible without compromising power, productivity or drilling performance. Reduced engine runtime also results in lower maintenance requirements and improved equipment longevity.

With Smart EMS, EDC experienced 14% fuel savings when compared to similar rigs. The operator also decreased engine runtime by 28% in six months which extended the time between overhauls, thereby reducing maintenance costs.

"Smart EMS is the perfect solution that aligns with EDC's strategy to operate the rig with the highest performance and lowest operating costs," said Abd El Tawab Ramadan, engines workshop manager at EDC.

Procuring Cat Reman parts through Mantrac Cat, one of the leading providers of Cat Reman solutions in the Middle East, enabled EDC to further realize cost savings. Using genuine Cat parts, Cat Reman disassembles, cleans, inspects and updates every component with critical engineering updates and advanced processes to ensure like-new performance. Cat Reman provides drop-in convenience at 45-85% below the cost of new, with the return of used cores, and offers a same-as-new 12-month limited warranty.[5]

Scaling Drilling Efficiency with Smart Systems

Wellsite optimization technologies work together to provide drillers and operators more insight and flexibility than ever before. As operators look to reduce costs and remain competitive, automated solutions are differentiators that enhance competitiveness and reduce total cost of ownership.

In the Middle East where production optimization and GHG emissions reduction are growing priorities, technologies like Smart EMS deliver a practical pathway to advance operational and sustainability objectives that support greater energy security.

Investing in Smart EMS can deliver immediate benefits, reduce costs, improve equipment longevity and lower GHG emissions. With Smart EMS, operators can unlock greater efficiencies to cost-effectively scale operations.

"Working with Mantrac and Caterpillar's dedicated teams to provide parts, services, technical solutions and support has enabled EDC to maintain the highest equipment performance standards," said Wael El Kharat, EDC's engineering director.

[1] *https://www.iea.org/news/global-electricity-demand-is-set-to-grow-strongly-to-2030-underscoring-need-for-investments-in-grids-and-flexibility*
[2] *Oilprice.com. Six Global Energy Trends Shaping the Middle East in 2026.*
[3] *https://www.cat.com/en_US/blog/Gaining-Ground-in-the-Energy-Transition-with-Smart-Tech-for-Onshore-Drilling.html*
[4] *https://www.cat.com/en_US/by-industry/oil-and-gas/land-drilling-production/smart-ems.html*
[5] *Cat.com. 2024 Caterpillar Sustainability Report.*





CAT® POWERED MARINE HYBRID SYSTEM

Dramatically reduce operating costs

Today's marine industry operators are asking for less fuel consumption, lower operating costs, and less maintenance on vessels.

The Cat® Marine Hybrid system optimizes the use of currently available components and operates diesel engines at peak efficiency. This means significant reductions in owning and operating costs, with decreased fuel consumption and maximized reliability.

With this system, your vessel has the potential to increase operating efficiencies as well as meet or exceed increasingly stringent environmental requirements. It is particularly well-suited for vessels with duty cycle variance; such as those that have numerous load requirements for propulsion and power. In comparison with conventional vessels, the Cat Marine Hybrid system provides several benefits to vessel operators:

- Decreased fuel consumption by up to 25 percent
- Extended maintenance and replacement intervals
- Payback periods of less than five years in many instances
- Reduction of harmful emissions (CO^2, NO_x, particulate matter and soot)
- Noise reduction

Hybrid Modes of Operation

The Cat Marine Hybrid system enables the vessel to operate in four different modes:

Strictly Electric: In this mode, batteries permit the vessel to be operated without the use of diesel engines or generators. Strictly Electric enables operators to operate their vessel with zero emissions and complete noise reduction. Batteries are available in lead acid or lithium polymer chemistry.

Diesel-Electric: In Diesel-Electric, power and propulsion are provided from the auxiliary generator via the motor generator without the need for diesel engines.

Conventional: In Conventional mode, the vessel operates as a traditional vessel with the diesel engines providing propulsive power and auxiliary generators supporting the hotel loads.

Electrical-Mechanical: In Electrical-Mechanical, both the main engine and the motor generator can provide propulsive power to the shaft line. Hotel loads are supported by the generators with the use of modern conversion technology.

Automation plays pivotal role

The maritime industry is undergoing a fundamental shift. As operators face tightening emissions regulations and strive for lower total cost of ownership (TCO), several are transitioning from conventional power to hybrid and fully electric systems. However, this transition introduces a new set of variables.

As operators evaluate these new architectures, questions naturally arise regarding vessel operation and performance optimization—especially as a crew's core expertise often lies in conventional mechanical systems. Automation plays a pivotal role here. To ensure dependable, efficient operation that maximizes the advantages of electrified power, sophisticated supervisory controls and battery management systems are essential.

Transitioning to Electric Propulsion

Operating a hybrid or fully electric vessel can provide some unique benefits, however a shift in mindset for the bridge and engine room is necessary. Electric motors deliver immediate power with nearly instant torque. This provides exceptional maneuverability, but it creates a learning curve for crews accustomed to the slower throttle response of conventional engines.

Additionally, battery sizing is critical. In an electric ecosystem, the performance, long-term endurance and vessel lifecycle depend heavily on selecting the correct capacity. An undersized marine battery can limit operational windows.

Intelligent Controls are Essential for Hybrid and Electric Marine Propulsion Systems

Whether a vessel utilizes a hybrid configuration or a fully electric marine battery system, the synergy between hardware and software is crucial. Managed by the Cat Supervisory Control System and Battery Management System (BMS), supervisory controls are integrated into every hybrid powertrain.

The system optimizes fuel and greenhouse gas (GHG) emissions reduction while prioritizing battery life and vessel power. It also maximizes performance when lower carbon-intensity fuels are used by leveraging a parallel propeller driveline[1].

For vessels equipped with the Cat marine battery system, the BMS manages the health and safety of energy storage. It monitors temperature, charge state and cell balancing to ensure the battery operates within its ideal performance window.

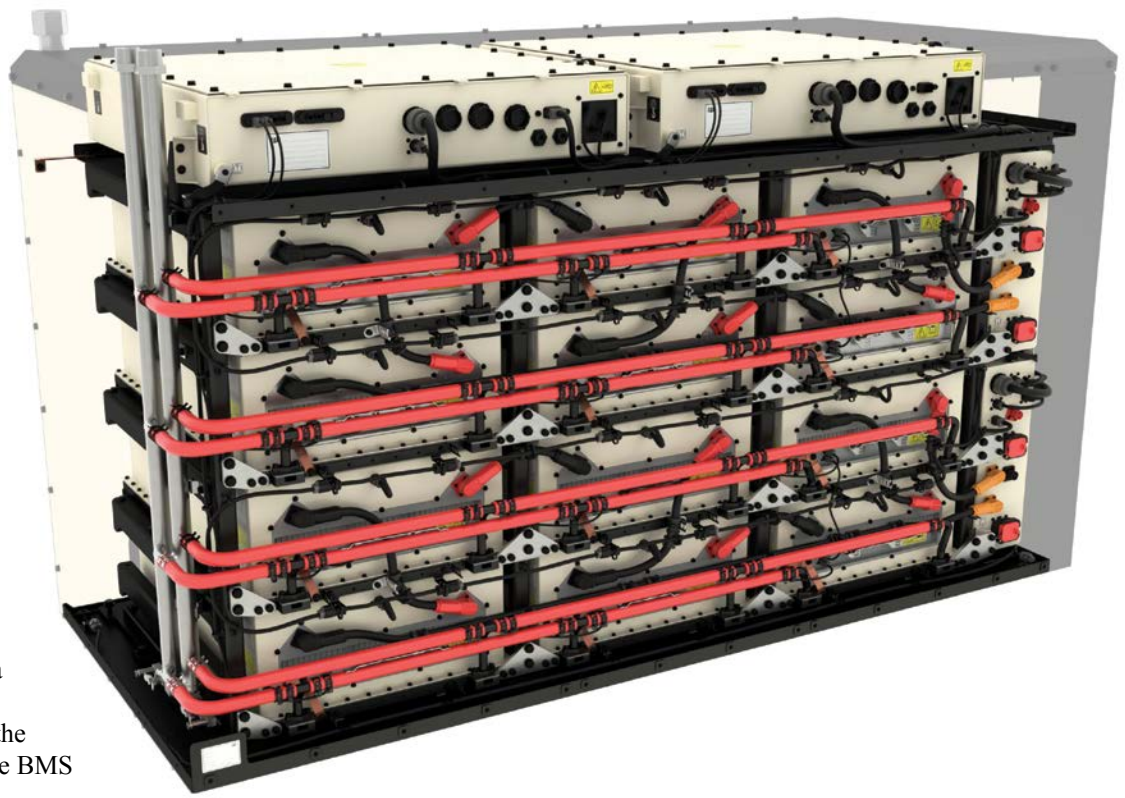
As Hybrid Marine Engineering Specialist Marvin Baer notes: "We've leveraged Caterpillar's enterprise-wide expertise to bring the BMS and Supervisory Control System to marine applications. This enables our CE-certified Cat marine battery system to provide operators with the safety and performance their operations demand."

Integrated Control Systems Optimize Vessel Power

The true value of these integrated controls is evident during critical operational moments. The Supervisory Controls System, for example, may prioritize electric propulsion to reduce fuel burn and GHG emissions during low-load operations. When peak power is needed, the controls automatically blend engine and motor output for maximum thrust. For marine battery-powered vessels transiting between ports, the BMS gives crews confidence in the available charge and health of the battery to ensure operational safety.

While the maritime industry evolves, safe, reliable and efficient operations remain a priority. By deploying intelligent, integrated control packages, operators can apply conventional experience to next-generation power solutions. These tools don't simply manage power—they position vessels to operate reliably for decades to come.

[1,2,3,4]*Compared to the C32.*



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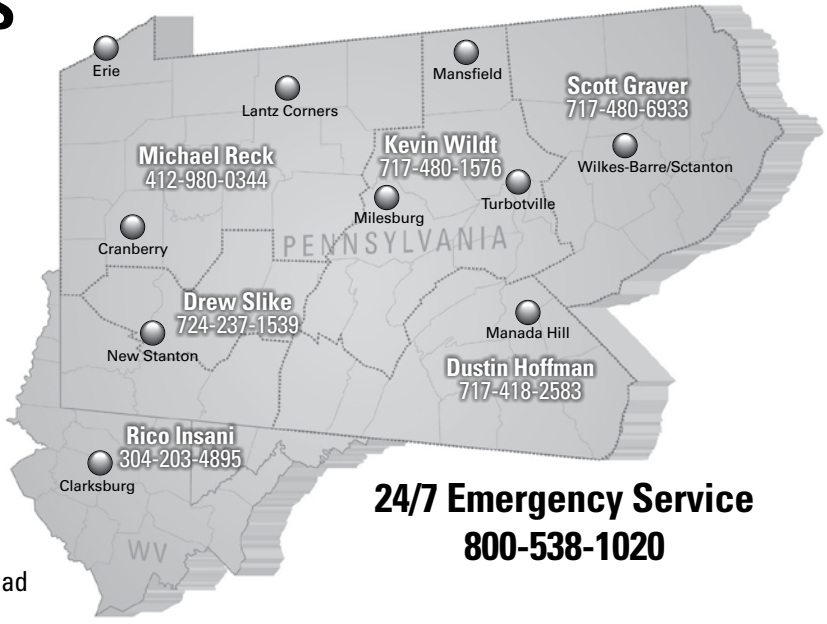
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