

STANDBY GENERATOR SETS HELP THE INTERNET ECONOMY STAY ONLINE

SIX OF THE 10 BIGGEST INTERNET-BASED COMPANIES CHOOSE MTU ONSITE ENERGY



- // **Who:** Data centers
- // **What:** Standby power systems with multi-unit MTU Onsite Energy generator sets providing critical power in the event of a utility outage
- // **Where:** Throughout North America



North America

The online retailers, auction sites, search engines, social media, banks and software companies that form the backbone of the Internet economy need to be operational 24/7/365. That's why one of the major goals of any online business is continuous uptime.

To cope with costly power failures or even brief nuisance outages, these businesses equip themselves with layers of backup power systems that include emergency standby generator sets from MTU Onsite Energy. In fact, six of the online economy's top 10 companies rely on MTU Onsite Energy standby generator sets to keep power flowing to their critical facilities.

Major firms rely on generator sets from MTU Onsite Energy

The biggest names in e-commerce have chosen MTU Onsite Energy emergency standby generator sets for several important reasons. These include:

- // Generator sets that offer high reliability, rapid response to changes in load, superior fuel economy and low emissions

- // Critical-power generator set packages that are configured, tested and certified at the factory
- // A sales team that listens, pays attention to detail and delivers solutions that meet or exceed specifications – on time and on budget
- // A customer service network that includes more than 300 distributor and service center locations throughout North America

Different online companies assess their risks differently, and this can affect the design of the standby power system, the amount of redundancy and the operational parameters. Following are examples of how four major online companies are using MTU Onsite Energy emergency standby generator sets.

Internet services firm

Well known for its leading search engine, Web portal and email service, this company has online offerings available in dozens of languages, which attract hundreds of millions of users each month. The company has installed 21 MTU Onsite Energy generators that form the core of its backup power system at several facilities. Each generator set provides 2,000–2,250 kW of emergency power for a total of approximately 44 MW. Like those of many other firms, the company's power scheme includes layers of redundancy. Multiple utility feeds provide the first line of defense; if there is an outage from one substation feed, the second one will automatically take over. Next, UPS systems instantaneously take over if the utility feeds fail, and will provide power until the standby generator sets start.

Many companies use generators running in parallel. However, this company has opted on a few project sites to use individual generator sets to back up different segments of the load. In these unique installations provided by MTU Onsite Energy, every generator set in the system

is kept in sync with a “reference source,” which is either another generator set or another utility feed. By maintaining a minimum phase angle (five to 30 degrees) difference between the operating source and the reference source, power switchovers are instantaneous and produce no disrupting transients. In this case

the goal was to reduce complexity and single points of failure in the standby power system without reducing reliability.

Software developer

With yearly revenues in the tens of billions of dollars, this major software development firm also offers popular online services and entertainment products. MTU Onsite Energy has supplied gensets to four of this firm's data centers. After development and construction of two major data centers where the supplied equipment had challenges handling the load characteristics, the software company turned to MTU Onsite Energy for a solution at a new data

center. The innovative data center is pioneering the use of multiple computer server modules housed in ISO containers. Designed for fast installation, the containers are ready for use once connected to power, air conditioning and networking equipment.

This new data center uses 11 MTU Onsite Energy 2,800 kW generator sets powered by MTU 20V4000 engines. For enhanced reliability, also included are dual battery banks and chargers, as well as dual fuel/water separators with special valves that allow users to change fuel filters without having to shut down the generator.

The standby power solution from MTU Onsite Energy includes alternators that are substantially oversized and feature a subtransient reactance of only 8.3 percent in order to accommodate the high level of nonlinear load. In addition, the MTU Onsite Energy generator drive engines feature 25 percent greater cylinder displacement, giving the engines much more reserve capacity than other generator drive engines of similar horsepower.

Online retailer

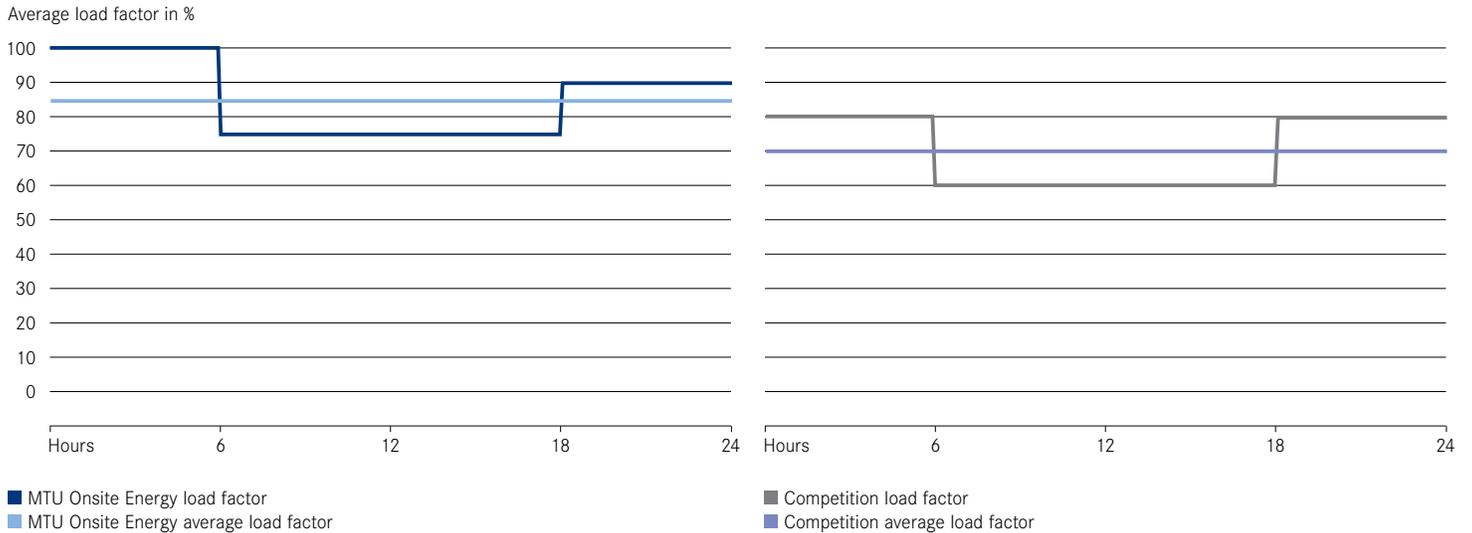
Different e-commerce companies have different ideas about what is needed to provide an acceptable level of reliability. This Fortune 500 company, one of the world's leading online retailers, chose MTU Onsite Energy to supply standby power for several of its data centers. This company was willing to explore value engineering options in order to reduce the cost of the project, and MTU Onsite Energy helped design a more value-oriented standby power system without sacrificing the overall mission of the facility.

The company has many data center locations, and its strategy is to share redundancy between data centers in addition to having power redundancy within data centers. This means that if utility power is lost at one data center and the emergency standby system also fails, the data load is seamlessly shifted to another online data center. In addition to having enhanced power reliability, these so-called “decentralized data centers” offer faster data communication speed and improve the customer experience.

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MTU ONSITE ENERGY LOAD-FACTOR ADVANTAGE



Data center operator

A leading U.S.-based owner and operator of wholesale data centers used by technology companies needed an emergency standby power system with exceptional reliability. It turned to MTU Onsite Energy. Specifications for this company's standby power system were influenced more by performance than by price, due to the high cost of downtime for the firm. Its reliability goal was 99.99999 percent, which equates to one four-second outage annually.

MTU Onsite Energy provided a new system that includes a number of MTU Onsite Energy 2,250 kW generator sets integrated into a single system. In addition to helping the firm meet its reliability requirements, the generator sets were designed with oversized alternators to handle the high nonlinear loads caused by the UPS systems and variable-frequency drives.

MTU Onsite Energy customized its generator sets in other ways to meet the company's special requirements. For example, the firm asked for and received units with an extremely fast seven-second starting time. In addition, MTU Onsite Energy supplied generator sets that met the strict emissions standards of the state Department of Environmental Quality.

MTU Onsite Energy offers many advantages for critical applications

MTU Onsite Energy offers highly reliable products and provides a unique approach to maximize customer satisfaction. To the benefit of risk-averse data center designers, MTU Onsite Energy takes a very conservative approach to designing and rating its generator sets. For example, MTU generator-drive engines are designed with more cylinder displacement per rated horsepower than alternative products. As a result, MTU Onsite Energy generator sets are certified at an 85 percent average load factor over 24 hours, significantly higher than the 70 percent average load factor required by ISO 8528. Other generator set manufacturers merely meet the ISO load-factor minimum, which means that the average load factor that can be sustained by most generator sets over an extended power outage is only 70 percent of the nameplate rating. Since MTU Onsite Energy gensets can handle 15 percent higher average loads than competing products, users may be able to specify fewer generator sets for data center applications, depending on the size of the installation.



Critical data centers consume prodigious amounts of electric power to run servers and the air conditioning needed to get rid of heat the servers produce. This means backup power systems must be designed to handle considerable loads.

For instance, a 2,000 kW generator set operated at 70 percent load factor can only supply an average 1,400 kW over 24 hours, while an MTU Onsite Energy 2,000 kW generator set rated at 85 percent load factor can supply 1,700 kW. In larger installations, this means that nine MTU Onsite Energy generator sets operating at 85 percent load factor would be equivalent to 10 standard generator sets operating at 70 percent load factor. The MTU displacement advantage also results in lower engine stress, reducing maintenance and lengthening engine life. With more reserve capacity than competing products, MTU engines offer good transient performance as well, stabilizing sooner after loads are applied or removed.

Another feature that gives MTU Onsite Energy gensets a competitive edge is MTU's advanced common rail fuel injection, which helps engines with 3,000 hp or higher output meet the U.S. Environmental Protection Agency's Tier 2 emissions requirements.

An important customer service difference between MTU Onsite Energy and its competitors concerns the role of distributors. For critical installations like data centers, competitors rely on their distributors to make modifications to the generator sets in the field. The results vary,

depending on the capabilities of the distributor. By contrast, MTU Onsite Energy's data center packages are supplied directly by the factory. These packages also include factory warranties and support, so customers have to deal with only a single source.

MTU Onsite Energy also takes a different approach to the factory acceptance test (FAT), when the vendor demonstrates to the customer that system design and manufacturing meet project requirements. Most specifications call for such a test, but only MTU Onsite Energy offers it in a factory setting. Customers witness the FAT at the company's impressive state-of-the-art test facility at the Mankato, Minnesota, manufacturing plant; this gives customers an up-close look at the manufacturer that they wouldn't get if the testing were done at a distributor's site.

Conclusion

Many of the businesses that form the backbone of today's e-commerce rely on MTU Onsite Energy to provide standby power, power that keeps these companies online all the time to meet customers' needs and expectations. By helping to ensure that critical data centers stay up and running, MTU Onsite Energy is playing a vital role in maintaining the burgeoning online economy.

MTU Onsite Energy Company

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MTU Onsite Energy is a brand of Rolls-Royce Power Systems AG. It provides diesel and gas-based power system solutions: from mission-critical to standby power to continuous power, heating and cooling. MTU Onsite Energy power systems are based on diesel engines with up to 3,400 kilowatts (kW) power output, gas engines up to 2,150 kW and gas turbines up to 50,000 kW.

