Power Generation

UNDERGROUND DATA CENTER RELIES ON ROLLS-ROYCE POWER SYSTEMS TO MITIGATE RISK

Who	Cavern Technologies
What	Four 500 kWe Series 1600 DS500 diesel generator sets with tailor-made master control panel and paralleling switchgear
Where	Lenexa, Kansas, USA

Since 2007, Cavern Technologies, a state-of-the-art underground data center, has experienced rapid growth, doubling its footprint in 2015 to meet the needs of its growing client base. The 120,000-square-foot colocation facility meets the specialized power, cooling and security requirements of more than 100 of the region's leading banking, healthcare, insurance, legal and technology companies. The company's latest expansion of 60,000 square feet required backup power that would support the facility's existing power needs, while offering the flexibility, scalability and expandability needed to support future growth.

Settled in a limestone cave 125 feet beneath Lenexa, Kansas, Cavern Technologies offers private data suites to some of the nation's leading healthcare organizations, financial services institutions and tech companies. Taking their servers underground, these

A Rolls-Royce solution

colocating enterprises are protected against weather and security breaches by a natural rock bunker five times stronger than concrete that accommodates their specific space, power and connectivity requirements.

Colocation is a growing trend as companies bear the burden of managing an escalating amount of data, shrinking IT budgets and the rising cost of utilities. According to a recent report published by Allied Market Research, the global colocation market is expected to reach $51.8 billion by 2020, with the United States poised to lead that growth. The need for flexible IT infrastructure drives the market.

“The best colocation provider will provide far more than four walls, electricity and network connectivity. Ensuring clients that systems keep running as they should, no matter what, with the help of critically important redundancies like uninterruptible, concurrently maintainable power supplies and backup generators, is what sets us apart from the competition,” said Scott Herron, vice president of data center operations at Cavern Technologies.

This demand has helped Cavern Technologies double in size year-over-year and increased its growth by 50 percent.

Mounting demands

Designed to support small, medium and large enterprise customers, Cavern opened its data center doors in 2007. Seven years later, the company embarked on a 60,000-square-foot expansion that brought its total operating space up to 120,000 square feet, with 100,000 square feet more available for expansion. Today, as one of the Kansas City region’s largest data centers, having an uninterruptible power supply is critical.

To power its new footprint, Herron turned to Central Power Systems & Services, an authorized MTU distributor in Kansas, Missouri and the Oklahoma Panhandle. Leading the project for Central Power was Paul Chaponniere, whose partnership with Cavern has spanned many years. Through close collaboration, Herron and Chaponniere customized four MTU Series 1600 DS500 500 kWe backup diesel generators for the subterranean data center’s specialized needs.

Three of the units were installed in late 2014, each outfitted with a tailor-made master control panel (MCP) and set to run in parallel. In 2017, after three years of dependable backup power supply from the MTU units, Cavern’s continued growth required additional backup power. To accommodate the increased needs, the Rolls-Royce MTU and Central Power team consulted with Cavern before customizing, delivering and seamlessly installing an additional backup diesel generator set within two weeks.

The systems are designed for proper load and complex function management from an integrated single source and allows Cavern Technologies to deliver on its customer guarantee of beyond 99.995 percent uptime.

1 Accessible through remote monitoring and touchscreen interface, Cavern’s custom master control panel enhances reliability and flexibility.

2 MTU diesel generator sets have a 15 percent higher average load factor than the industry standard.

3 Located 125 feet beneath the earth’s surface, Cavern Technologies takes data security to another level, fortified by a natural limestone bunker five times stronger than concrete.


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"Our business is built on reliable power. Without it, we would be unable to serve our customers," said John Clune, CEO of Cavern Technologies. The MTU Series 1600 fulfills that need.

Award-winning reliability

Honored as "Product of the Year" in 2010 by *Consulting Specifying Engineer* magazine, the Series 1600 generator set provides exceptional reliability, high power density and fuel efficiency in the 250 kW to 600 kW power range. Generators feature an MTU engine engineered specifically for gen-drive applications and an outlet box designed to incorporate the breaker and control panels in one streamlined package. This design allows flexibility to switch the control panels and breakers to the right or left depending on the need and allows the mainline circuit breaker to be installed in a compartment on the right or left side per customer specification. The outlet box can accommodate multiple mainline circuit breakers, utilizing both compartments.

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Data center customers, like Cavern, can typically specify fewer generator sets for applications, depending on the size of the installation. This is because MTU diesel generator sets are certified at an 85 percent average load factor over 24 hours—15 percent higher average loads than the industry standard.

Nothing left to chance

Although inherent redundancy was built into the Cavern Technologies systems with the four units in parallel operation, Rolls-Royce created a custom MTU master control panel for Cavern to add an additional layer of reliability. The best modern generator sets are computer-controlled to decrease likelihood of system failure. Generator set controllers provides system control, metering, protection, fault-alarm-status indication, event recording, system-auxiliary drive controls and programmable logic in a simple, easy-to-use package designed to ensure readiness of the standby system when needed.

Cavern's tailor-made MCP is dynamically programmed to accommodate up to eight generator sets and 16 Automatic Transfer Switches in any configuration. The unit's user interface also updates automatically, eliminating the need for hardware change-outs. All of these features add to the flexibility of the Cavern Technologies solutions package.

The MCP also provides a segregated fieldbus Ethernet interface that allows building management systems secure access without sacrificing the integrity and redundancy of the systems' critical function network. This segregated Ethernet interface also allows for password-protected remote control of the emergency power backup system.

Remote monitoring capabilities enhance reliability of the total system by helping to identify issues before they become problems. In addition to remote monitoring and control, permitted users of the Cavern MCP can securely access all system functionality from the touchscreen human machine interface on the MCP itself.

"To a great extent, reliability can be designed into generator sets, transfer switches, switchgear and control systems to increase the likelihood that they function as intended," said Mitch Wilking, regional sales manager. "The flexibility and structure of Cavern's master control panel is an example of this and stands out as an engineering highlight of the system."

Power in aggregate

With an eye toward future growth, up to three additional 500 kWe units can be installed to power the data center. In the existing paralleling environment, the additional generators will install and configure seamlessly thanks to Cavern's MCP, while leaving capacity to scale up even more as power demands continue to grow.

Cavern Technologies didn't leave anything to chance. With its MTU generator sets in place, they are reassured that they can deliver what every customer needs: a strong infrastructure that ensures the integrity, continuity and redundancy of their data.

Rolls-Royce provides world-class power solutions and complete lifecycle support under our product and solution brand MTU. Through digitalization and electrification, we strive to develop drive and power generation solutions that are even cleaner and smarter and thus provide answers to the challenges posed by the rapidly growing societal demands for energy and mobility. We deliver and service comprehensive, powerful and reliable systems, based on both gas and diesel engines, as well as electrified hybrid systems. These clean and technologically advanced solutions serve our customers in the marine and infrastructure sectors worldwide.

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