

Keele University Deploys Ultra Efficient Data Centre Power Protection that Supports Its Sustainability Goals



A Vertiv Case Study



Background

Located in rural Staffordshire, England, Keele University is recognised as one of Europe's most sustainability-driven universities. Established in 1949, and with more than 10,000 students conducting critical research on important global issues, including food security, health, climate change, smart energy, and sustainable futures, the university campus has grown into one of the largest in the United Kingdom.

The university's mission supports the vision of a more sustainable world and uses the United Nations Sustainable Development Goals as a framework to embed sustainability in all aspects including leadership and governance activity, research and education, day-to-day operations, and external partnerships and engagement.

Since 1990, the student population has tripled, and the campus area has expanded while simultaneously decreasing total carbon-dioxide (CO₂e) emissions. Over the last six years, the university has invested more than £1.2 million into carbon reduction and is investing more every year; with a pledge to attain carbon neutrality by 2030.

Keele University has also been globally recognised for establishing a deep-rooted sustainability culture. For the fourth consecutive year, the university has been named among the top 40 universities in the world for sustainability (UI Green Metric World Rankings, 2020).

The university was also the recipient of the Green Gown Global Sustainability Institution of the Year award in 2021. The Green Gown Awards recognise exceptional sustainability initiatives being undertaken by universities and colleges worldwide.

Challenge:

Reduce energy consumption of on-campus data centres whilst modernising power protection assets

Solution:

- Vertiv™ Liebert® APM 600 modular UPS
- Vertiv centralised multi-string battery system

Results:

- Up to 99% efficiency
- Significant space savings due to use of future-ready modular solutions
- Minimized downtime risk for critical workloads
- Data centre supported by 100% locally generated renewable resources

Besides hosting the first UK trial of hydrogen blending within a gas network and testing new smart energy technologies, the university is now producing its own renewable energy on campus. Recently commissioned solar and wind farms are now operational and feed power into a campus mini-grid. From a power distribution perspective, the campus operates like a small town. As well as hosting the traditional student accommodations, academic research facilities, and classrooms that require power, a post office, a hairdresser, gyms, grocery stores, cafés, and restaurants also make up part of the university's power load.

Challenge

IDS takes on aggressive decarbonisation efforts

As part of Keele University's pledge to be carbon neutral by 2030, the university's Information & Digital Services (IDS) Directorate team, which encompasses both the library and information technology (IT), has been working with university colleagues to make its on-site IT infrastructure as energy-efficient and low-carbon as possible.

Keele operates two on-site data centres which support on- and off-campus users to deliver teaching, research, and professional services. The two data centres consume nearly 300 kilowatts (kW) of power per year between them.

To support the university's sustainability initiatives, the IDS team established three goals as they pertained to both its existing and soon-to-be-built data centres:

- **Energy savings** – Since the data centres account for a significant portion of carbon emissions, the IDS team has instituted policies to purchase energy-efficient IT and operations technology (OT) equipment whenever possible. In this way, the data centre equipment will require less power to run and produce less heat, reducing the need for thermal management.
- **Low emissions supply chain** – Initiatives are also underway to ensure that the data centre purchasing teams emphasize working with suppliers who are environmentally conscious. For example, cable suppliers who avoid using plastic as part of their packaging are looked upon favorably when purchasing decisions are made.
- **Space savings** – A new facility called the Innovation Centre 7 (IC7) is in the process of being built. The new building will allow academics, researchers, and industry to have a shared space that facilitates the exchange of ideas in a collaborative, interdisciplinary environment. A new data centre will be part of the IC7 build, and the university is looking to lease out space to either tenants in the building or external clients. As a result, space savings will be key, and the new data centre equipment footprint must be kept to a minimum.

Solution

Engagement with Vertiv to lower energy consumption

The IDS team currently operates two data centres, one in the library and one in the sports centre. The library data centre is scheduled to be decommissioned and will be moved to a site in the new IC7 building. This will place the two data centres at opposite ends of the Keele University campus, thereby enhancing resilience and redundancy should any disaster or emergency situation occur.

In the effort to modernise the university's data centres, the IDS team turned to long-time partner Vertiv to help boost energy efficiency. "We've used Vertiv for a number of years now. The company acts as our sole supplier of uninterruptible power supply (UPS) systems," said Alex Goffe, Associate Director of Operations & Infrastructure at Keele University. "The UPS units are key to providing clean and stable power to our IT loads. They are mission-critical, which is why we've chosen to continue with Vertiv."

Since the existing UPS systems were aging, the IDS team asked Vertiv to recommend new units that would be both more energy efficient, as well as scalable and space efficient.

The local Vertiv team recommended the Vertiv™ Liebert® APM 600 with a 400 kVA capacity in a N+1 configuration. The new UPS is based on a reliable, double-conversion power topology that uses an efficient transformer-free design. The new design results in energy efficiency of 96% that can be enhanced to 99% using ECO Mode operation. The new UPS also delivers more capacity in a smaller footprint. Each of the new units utilises a modular and scalable configuration with ancillary cabinets designed to save space and cost.

"The scalable nature of the new UPS provides us with a high degree of flexibility. If the load level drops, we can take power modules out. Or, if there is a need to grow in the future, we can add power modules into the frame to extend the power capacity of the system," Goffe said.

"We wanted to minimise losses as energy is transferred from the grid to the UPS and on to the IT load," Goffe added "We also wanted a new generation of highly sustainable batteries that could handle any power dips that we might experience."

"We are generating enough power now to run the campus, and our data centres today are being powered by on-site renewable energy."

- Alex Goffe, Associate Director of Operations & Infrastructure, Keele University



Vertiv™ Liebert® APM 600 kVA UPS

Results

Modular batteries enhance systems uptime

In the case of batteries, Vertiv recommended replacing a bank of very old, inefficient, open-air lead-acid batteries with modern, rack-based, self-contained battery modules. The new battery modules may be added or replaced online with no interruption or danger to the connected equipment if the UPS is not operating on the battery.

The simplified setup allows easy installation and is fault-tolerant, so that modules can be removed and replaced without power disruptions. Each battery module has monitoring and controls that isolate the battery module in the event of a battery failure. The battery strings are connected in parallel to provide backup time and/or redundancy.

Keele University buys renewable power from the local grid and now will have its own wind and solar power (including energy storage) to supply the data centre and university power loads. In fact, with the construction of IC7, Keele is believed to be the only university in the UK to be building a data centre which will use 100% renewable energy.

Looking ahead to a carbon-neutral future

Keele University plans to complete the construction of its IC7 building later this year. Besides hosting the new data centre, the building will be home to the university's new Digital Society Institute, a collaborative centre focused on data and digital technology which will allow companies in the business, health, and cultural sectors to innovate and expand in a competitive and dynamic business environment. The site will utilise high-performance computing infrastructure to conduct artificial intelligence and big data analysis research.

The new 5.5 megawatt renewable energy site will generate up to 50% of the university's campus electricity requirements, and is a major development to support the university's aim to be carbon neutral by 2030.

Key Features & Benefits:

- Hot-swappable modular architecture that can be scaled for row or room applications
- Independent digital signal processing (DSP) control system per module for auto-regulating operations and enhancing overall availability
- Double-conversion mode of operation for maintained levels of efficiency regardless of load level
- ECO Mode operation for increased efficiency up to 99%
- Unitary output power factor for protection of mission-critical loads and for selecting a power rating most appropriate for the application
- Integrated parallel and load bus synchronization with controls that enable easy deployment of Tier 4 architecture
- Flexible battery configurations designed to meet runtime and floor space requirements

Go online to learn more about how Vertiv™ UPS and battery solutions can help enable energy-efficient data centre operations.



DCS Awards 2022 - Data Centre Sustainability Project of the Year - Vertiv in Partnership With Keele University

Vertiv.com | Vertiv Infrastructure Limited, Fraser Road, Priory Business Park, Bedford, MK44 3BF, United Kingdom, VAT Number: GB60598213

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