



ABOUT THE COMPANY

The German Climate Computing Centre (DKRZ), located in the centre of Hamburg, is renowned by climatologists from around the world. Here, a team of nearly 80 employees combines technical expertise and special high performance computers to perform complex climate simulations for research purposes. As these simulations require significant computing and data storage capacities, DKRZ has been continuously improving its computing power in order to stay abreast in an evolving and competitive industry. With the installation of a new high performance computing system, Mistral, in summer 2015, DKRZ has seen performance increase twentyfold, at a lower power consumption. The investment into increased computing power and storage capacity has helped to make DKRZ one of the world's elite computing centres for climate research.

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Challenge: An Eco-Friendly UPS Solution

DKRZ was faced with the challenge of upgrading its computing power in an efficient way to ensure reliable and failure-free operations for its new mainframe computer, Mistral. The computer's energy consumption constantly changes, and can deviate up to 50 percent within fractions of a second. As a result, it was necessary to equip the existing computing centre with a completely new infrastructure, including an uninterruptible power supply (UPS) capable of bridging temporary current fluctuations with ease.

Another key point in DKRZ's tender for a new UPS, either static or dynamic, was determining the total cost of ownership (TCO), adding up and comparing the incidental costs of investment, operations and maintenance for the first five years. The **Liebert® Trinerergy™ Cube** UPS clearly outperformed competing products given its low operating costs and highly efficient, eco-friendly technology.

“As a company in the field of climate research it was of particular importance for us to find a solution that reduces energy consumption” says Ulf Garternicht, project manager & head of department for DKRZ. “Because of its high efficiency and low energy losses, Liebert Trinerergy Cube achieves significant savings of carbon dioxide emissions, and that was a determining factor when making the decision.”

Solution: Liebert Trinerergy Cube's Unique Technology

The Liebert Trinerergy Cube configuration at DKRZ is particularly unique. By interconnecting a total of six 400 kVA modules, a single UPS system provides 2400 kVA of power. However, this is only one example of numerous technical advantages which the Liebert Trinerergy Cube provides:

- A unique feature is represented by its **three dynamic functioning modes**. The mains, the networks as well as the load distribution of the server are continuously analysed by the unit, which automatically selects the most suitable operating mode. The Voltage Frequency Independent (VFI) mode, or double conversion mode, provides maximum power control, while the Voltage Frequency Dependent (VFD) mode allows for maximum energy savings. The Voltage Independent (VI) mode achieves high efficiency and power conditioning at an optimal level. A yearly average operational efficiency of 98.5 percent is achieved with these dynamic modes while simultaneously keeping operation costs and carbon dioxide emissions at a minimum. In case of a deviation in the grid or from the values set by the user, the UPS will always operate in VFI mode. Liebert Trinerergy Cube reaches in both VFI/VI modes the standard IEC/EN 62040-3 VFI-SS-111, which is the highest quality, Class 1.
- The **modular design** allows for the expansion of the UPS capacity when changes in load requirements occur. Additional power cores can be hot-scaled when necessary, which allows for a peak performance of up to 27 MW in a parallel system. At DKRZ, the UPS system currently provides 2.4 MVA of power. The modular design also enables the power for each core to be managed individually. Depending on load requirements the modules can even be switched to sleep mode (circular redundancy) in order to further save energy and reduce costs.
- Liebert Trinerergy Cube is **extremely resilient**. UPS installations usually operate at an ambient temperature of 35° C and switch to bypass at higher temperatures because of the danger of overheating. On the contrary, Liebert Trinerergy Cube can operate at temperatures up to 55° C and continues working even beyond that at reduced power without interruption. This means that the secure power supply is always fully guaranteed, regardless of any potential disturbances in the thermal management systems.

Convincing Witness Tests at the Customer Experience Centre

During the tender's decision-making period in January 2014, a DKRZ delegation visited the Vertiv **AC Power Customer Experience Centre in Bologna**, Italy. "It is important for us that our customers have the opportunity to witness test and be fully convinced about a product before purchasing," says Reinhard Purzer, vice president & managing director of Vertiv in Germany, Austria and Switzerland. "That's why we have given DKRZ the possibility to experience Liebert Trinergy Cube's modular technology first-hand, measuring performance and various data in real field conditions."

The complete 2400 kVA UPS system was tested with both the consultant and end customer for one and a half days at the Customer Experience Centre to ensure that it fulfilled DKRZ's needs. "Our visit to the Customer Experience Centre was a key factor in understanding the product, and seeing first-hand its unparalleled performance" says Ulf Garternicht.

Moreover, DKRZ required the development of a particularly small and light lithium ion battery in cooperation with YUASA Battery GmbH. This new, customized battery was extensively tested at the Vertiv testing facility in Erlangen, Germany, to ensure smooth implementation with the UPS system for future projects.

From Top to Bottom: Design, Installation and Services

Vertiv demonstrated great organisational competence during the design and installation phases of the project. Since the UPS was to be installed in the basement area which was inaccessible by freight lifts, each component had to be carried down through the crane opening and assembled afterwards. Moreover, due to spatial constraints, the UPS system had to be installed in a back-to-back configuration. Liebert Trinergy Cube's modular design was essential in making this installation possible.

The installation was greatly facilitated also by the possibility to place busbars directly within the UPS connection cabinet. The compatibility of the connection with the existing power rail grid represents an easy to use, space-saving alternative to conventional cabling. In addition, a busbar connection provides a far better electromagnetic compatibility and a more secure infrastructure compared to a cable system.

Following the completion of the installation, the Vertiv service team also took charge of the installation of the batteries and the parameterisation of the surroundings. After the final on-site UPS testing phase, as well as the inspection of the complete infrastructure by DEKRA, the mainframe computer Mistral was successfully put into operation in March 2015.

To top it off, DKRZ relies on **Vertiv Preferred Warranty** service contract, which includes preventive maintenance and 24/7 emergency service with 8 hour on-site response time. In case of any need, prompt support is granted by the expert field engineers based directly in the Hamburg Service Centre. Liebert Trinergy Cube's integrated web interface also allows DKRZ's computing manager to remotely control its touch-screen display using a mobile device, enabling real-time monitoring and management of the UPS equipment from any location. Moreover, DKRZ is considering complementing the service contract with first-class **Vertiv LIFE™ Services**, for complete peace of mind.

Conclusion: Expertise and Project Planning Pays Off

DKRZ was impressed by Vertiv's expertise in providing an efficient, low TCO UPS system as well as a professional and thorough planning for the installation phase. The extensive witness testing at the Customer Experience Centre further demonstrated Trinergy Cube's industry leading performance, giving DKRZ further peace of mind. Moreover, the successful implementation has placed Vertiv in pole position for the second phase of the installation, which would replicate the same UPS architecture so as to provide a 2N power redundancy. This will further guarantee that in case of any potential failure the computing centre will be able to smoothly continue operations. "Our product choice has been accurate in every aspect. Thanks to Vertiv we have been able to implement an advanced solution which guarantees business continuity despite any voltage fluctuations as well as reflecting our green philosophy. The whole project was carried out smoothly thanks to the competence and expertise of the team, and we look forward to continuing our partnership" says Ulf Garternicht.



Images are courtesy of Michael Böttinger.

Facts and Figures

- 2400 kVA of total power
- Dynamic 3-mode operation and modular design
- Low losses of energy and significant savings in carbon dioxide emission
- Test runs at the Vertiv Customer Experience Centre

Vertiv Solutions

- Liebert Trinergy Cube UPS system composed of 6 x 400 kVA modules
- Installation, start up and commissioning services
- Preferred Warranty service contract, including preventive maintenance, 24/7 emergency service with 8 hour on-site response time