

More secure  
than secure



Ilari Alaperä from ABB and Pasi Kuivalainen from CSC consider the shared pilot project to develop the AKKA system a success.

If the power supply to the data centers of CSC - IT Center for Science located in Espoo, Finland, failed, the Internet connections of several institutions and online services of many Finnish organizations would also risk failure. The 500 batteries in the data center have a great deal of responsibility. Their performance and condition are measured by ABB's new AKKA battery monitoring system.

Translated from the original Finnish "Varmaakin varmempaa"

**D**eep underground a hiss is heard when the pressurized door closes. A metallic clank informs that unauthorized access to the premises will not succeed.

"The heart of the data center", says Pasi Kuivalainen, Data Center Specialist at CSC, as he presents the power protection systems revealed behind the door.

In case of power failure, the power supply for the servers in the data center will be taken over in flash by the UPS system with its hundreds of batteries. In the neighboring room, a 800 kW diesel generator is ready to step in during longer grid disturbances.

Contemporary society has put its trust on thousands of data centers around the world working without interruption year after year. Even short interruptions in banking, cellphone networks, stock exchanges or online commerce, mean delays and trouble for us all – and, in the worst case, losses of millions of dollars to the service providers.

The batteries are the weakest link of the power protection systems in data centers and they have a great deal of responsibility. The energy from the batteries will keep the servers running for the first minutes of a grid failure.

UPS batteries have also another important duty. At home, we do not even notice interruptions in power supply lasting a few milliseconds, but they are fatal for data center servers.

"Our data center runs on batteries several times a year during short grid failures," says Kuivalainen.

**Terminal voltage of the batteries are tested every hour**

ABB has extensive experience of ensuring the vital functions of society. Numerous operating theaters, water management systems and data centers all over the world trust the power protection system provided by ABB.

Based on ABB's experiences and numerous international studies, power protection systems have one point of failure over others: UPS system batteries. At worst, a single faulty battery may endanger the functioning of the power protection system in its entirety, says Ilari Alaperä, Global Product Manager for ABB.

Modern UPS devices monitor the condition of the set of batteries in its entirety, but they do not detect failures of individual batteries. However, ABB's AKKA battery monitoring system installed in CSC's data center does detect them. Sensor wires connected to battery terminals reveal that batteries in this data center are under special surveillance.

Before, problems in the battery systems were discovered only during the annual maintenance of the power protection systems or in real-life situation when the set of batteries could not deal with its load during power failure. However, the individual batteries causing these issues were hard to identify. Now, AKKA tests the hundreds of batteries in CSC's data center once an hour and alarms the Data Center Solution team, that is in →



## Battery monitoring as a service

It is impossible to assess the life cycle of batteries in UPS devices without reliable measurements. ABB's AKKA battery monitoring system to be launched internationally in early-2016, performs the measurements by battery. This will reveal the weakest links in the set of batteries. Faulty batteries can be replaced immediately before they have time to affect the performance of the whole set of batteries.

AKKA product family has two devices: a portable version for condition monitoring measurements of batteries and fixed device for condition measu-

rement and continuous monitoring.

Battery monitoring provides better reliability and peace of mind to the customer. The service range built around AKKA system aims at the same goal. In addition to the system, ABB provides diverse services for all data center maintenance needs.

"We also offer a service contract in which you can include any services agreed, such as annual maintenance of increased safety electricity system, on-duty services and remote monitoring of batteries," says Ilari Alaperä, Global Product Manager.

charge of 24/7 monitoring of the data center immediately if the terminal voltage of an individual battery decreases. During annual maintenances the AKKA system is used to record the relative performances of the individual batteries making it easy to find and identify any batteries that are not performing as they should.

The different labels on batteries reveal that some of the batteries have reached the end of their life cycle and they have been replaced with new ones.

"The technical life cycle of these batteries is 10 years according to the manufacturer, but practice has shown that the actual life cycle of the batteries is between 7 and 8 years. It is not that long since the most recent alarm. We replaced two batteries at that time," says Pasi Kuivalainen.

Ilari Alaperä connects his laptop to the AKKA device mounted on the wall of the battery room and presents the measurement data from the previous annual maintenance. Battery monitoring considerably speeds up annual maintenance, since it automatizes the data collection of the load-bearing test performed on the batteries.

"You can imagine how much work it takes to measure 500 batteries by hand with a multimeter," says Ilari Alaperä.

Measurement curves of the hundreds of batteries at CSC data center from the last load-bearing test are drawn on the screen. All batteries did not pass the test and had to be replaced.

"Here you can see six batteries, the terminal voltage of which collapsed during the 15-minute discharge period."

### CSC helped with product development

Kuivalainen, who along the Data Center Solution team and its multiple service providers is responsible for the well-being of the data center, seems happy. His three greatest worries – power supply, cooling and data security – are all under control. The condition of the batteries is monitored 24/7 and temperature sensors hanging from the ceiling ensure that the cooling system works.

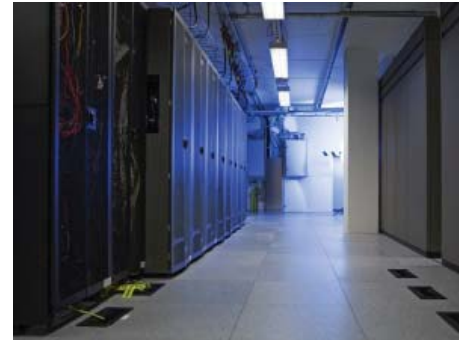
CSC is also ABB's product development partner. A few years ago, ABB decided to redesign the over 20-year-old battery monitoring system. CSC's AKKA system installed three years ago is one of the pilot installations of the redesigned system. The experiences of the pilot customer have been valuable to the designers of the device soon to be launched internationally. For his part, Kuivalainen appreciates the peace of mind afforded to the person responsible for the data center.

"AKKA system's reliability is a great benefit to us," says Kuivalainen.

"I sleep better at night."



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"At worst, a single faulty battery may endanger the functioning of the power protection system in its entirety."

**Ilari Alaperä**

Global Product Manager, ABB

- 01 The N+1 -UPS emergency power system of the CSC's Espoo data center produces electricity for the data center for 20 minutes. Diesel-powered emergency power generator reaches its full power in a few minutes. There is enough fuel in the tank of the diesel generator to last 72 hours.
- 02 CSC's Espoo data center in southern Finland has been in operation for over 10 years without breaks in production.

## CSC – IT Center for Science Ltd.

CSC - IT Center for Science Ltd. is a Finnish state-owned company, which maintains IT -infrastructure and provides IT services for the needs of research, administration, libraries, archives and culture.

- CSC connected Finland to the Internet in 1988.
- It is responsible for the higher education institution, research and teaching information network FU-

NET with 80 research organizations and 370,000 users.

- CSC provides researchers with the most powerful computation environment in the Nordic countries with a super computer.
- It has data centers in Espoo and Kajaani.
- It employs 260 people