

Article

PCS100 ESS - Providing a battery solution to one of Switzerland's largest energy distributors



PCS100 ESS 1 MW / 500 kWh battery solution at the Dietikon Powerplant based in Switzerland

ABB, together with the Canton of Zurich's power company (EKZ), has successfully installed a 1 MW power battery solution at the Dietikon Powerplant. The battery is integrated with ABB's PCS100 ESS (Energy Storage System) and is the largest of its kind to be installed in the Swiss distribution network. By improving power quality and grid stabilization, the PCS100 ESS will help preserve 500 kWh of energy – the equivalent consumed by a four-person household in 40 days.

Electricity is a vital part of a nation's infrastructure. In contemporary life we are utterly reliant on the electricity grid to supply power for industrial operations and general day-to-day living. A reliable and efficient grid connection is key to this public utility. The prime function of ABB's PCS100 ESS is to provide a spinning reserve of power in the event of power plant or transmission line equipment failure.

By using power electronics and advanced control, the PCS100 ESS looks like a traditional synchronous machine to the power system. There are no large spinning masses. Even inertia can be modeled within the system, enabling it to deliver or draw power to and from the grid, dependent on the system frequency and rate of change. Should the grid supply be lost the PCS100 ESS can detect this, disconnect from the grid and shut down.

This leading edge technology enables power plants, like the Dietikon Powerplant in Switzerland, to operate at their full potential without the interruption of voltage sags and swells.

Behind the scenes

The system at Dietikon Powerplant was built over a nine-month period, and is now incorporated into the medium voltage network of the EKZ. This will allow ABB and the customer to closely monitor the integration and behaviour of the battery storage, providing valuable knowledge for future installations.

Working together

The solutions supplied by ABB included a frequency converter that utilises efficient power semiconductor technology to convert the AC supply into DC for use via the battery, and vice versa. The battery is equipped with ABB control and protection systems. Based upon the input parameters and the defined equipment footprint, it was decided to package the PCS100 ESS in a freestanding outdoor enclosure.

The PCS100 ESS was for the first time integrated together with LG Chem batteries and supervisory controls. Battery integration and packaging was performed by ABB in Hungary.

The PCS100 ESS was designed to be primarily controlled via an external SCADA system, and operated in five primary control modes. These were scheduling (P/Q), peak-shaving / generation-smoothing, frequency regulation, islanding and advanced algorithms. Furthermore, one of the control modes – island mode functioning – was coupled with a VSI mode (voltage source inverter) to provide enhanced power quality and protection.



Battery container with LG Chem battery

The island mode is used when the system is disconnected from the main grid / power supply. In this case, the PCS100 ESS creates and maintains a microgrid of defined voltage and frequency, allowing independent operation. It supplies the connected loads from the battery and can also integrate renewable sources and use additional energy to charge the battery storage. This has the advantage of supplying loads when the main grid is not available, and defines how much power will flow in and which unit will be operational.

Project highlights

Peter Franks, head of Energy Distribution at EKZ, commented, “We are very pleased that we were able to implement this pioneering project here in Dietikon. This compensates for battery memory, short-term load changes in the distribution grid and serving locally produced electricity that again, can bring interesting new approaches to the distribution network operators. The knowledge we gain with this system contributes to securing the future of energy.”

Robert Itschner, Head of T&D Substations in ABB Switzerland, reiterated, “We are interested in how the system will prove charging and discharging of the battery bank in the field, in order to develop algorithms that allow optimal operation. The findings are to lead the way for such facilities, for the use of renewable energies, and their optimal use will continue to play an important role. Energy storage is a key component of future smart electricity grids.”

Looking towards the future

ABB and EKZ can look back on an already long and close relationship and are confident in PCS100's ability to help improve network stability and ensure greater security of supply. EKZ is one of Switzerland's largest energy distribution companies. An estimated one million people benefit from a safe, environmentally friendly power supply generated by the company.

EKZ is involved with numerous measures to increase energy efficiency and promote renewable energies.

ABB's PCS100 ESS Technology

The PCS100 ESS is available in load capacities from 100 kVA to multi MVA and allows control of both real power (P) and reactive power (Q) based on system requirements. Advanced control



The complete package: PCS100 ESS converter, LG battery, switchgear and transformer

features in the “Generator Emulation” mode of operation make this storage system look like a true power system component. The PCS100 ESS offers power system load leveling, grid stabilization, grid compliance for renewable and generation systems, and power quality improvement.

The PCS100 ESS provides wide bandwidth performance with a flexible and highly modular power electronic configuration. New energy storage devices, such as latest generation batteries, fly-wheel and super capacitors, provide the opportunity to store energy from the electricity grid and return it when required. Also this can be used with any kind of DC storage/source. This offers a range of options to strengthen and enhance the performance, quality and reliability of smart electricity grids.

To see further information please visit:

www.abb.com/energystorageandgridstabilization

