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# ABB Constructs World's Largest Battery Energy Storage System in Fairbanks, Alaska

## Overview

Golden Valley Electric Association in Fairbanks signed a contract with ABB to construct a Battery Energy Storage System (BESS.) The BESS will automatically pick up 26 megawatts of load for 15 minutes (or 40 MW for 7 minutes) in the event of power plant or transmission line equipment failure. Fifteen minutes is long enough to start up and bring local generation online. The switch from power line to battery and back to power line is seamless and goes unnoticed by the customers. So the prime function of the BESS is to provide spinning reserve. At the end of the spinning reserve sequence, the BESS will automatically re-establish the operation mode, which was active prior to the event.

## Power Conversion System (PCS)

The two primary subsystems in the BESS are the IGCT converter and the Ni-Cd battery. The battery is the energy storage medium. The IGCT converter is the interface between the DC battery voltage and the 60 Hz AC GVEA system voltage. The converter transformers match the converter output to the 138 kV system voltage.



## Converter Transformer

There are three single-phase transformers, each rating 14.9 MVA. The four primary windings of each unit are connected in series. The secondary windings are connected to the converter. On the AC-side the single units are star connected.

## Ni-Cd Batteries

There are four battery strings. Each string consists of 344 series connected battery modules. The batteries are monitored with a battery monitoring system (BMS.)

## Converter

On the AC line side the IGCT power converter consists of four paralleled twin connected three-phase units (total of 24 converter phases). On the DC side



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the battery is connected to the converter's DC link with an aluminum busbar system. Due to the power and the high number of phases, the converter is built of two converter frames (half converters). One of these converters includes a Voltage Limiting Unit (VLU.)

### DC-Filter Circuits

The purpose of the High Pass Filters is to balance the DC link voltage and to reduce the voltage ripple. The tuned Filters (60, 120 Hz) are designed in order to eliminate parallel resonances and to protect the batteries from harmonic current injection.

### Cooling System

The challenging environmental conditions of Fairbanks have been given significant consideration. The IGCT converter is cooled with a closed-water cooling system. This design has two water loops. De-ionized water is used for cooling of the converter. A raw-water/glycol solution, which circulates in a secondary loop, removes the waste heat via outdoor radiators.

### Control

The BESS system is controlled by a Pentium PC based control platform, the PSR II (Programmable High Speed Controller). The PSR II is programmed to provide all required control modes. In addition, the PSR II provides the BESS system protection. In addition it interfaces with the GVEA SCADA system and has a local graphical human machine interface (HMI.) Following operation modes are programmed:

Spinning Reserve, Automatic Scheduling, Support for Scheduled Load Increase, Automatic Generation Control, Var Support, Power System Stabilizer, Charging, Discharge Test Main Technical Data Plant: BESS GVEA, Fairbanks, Alaska, USA.

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