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TRACK: TECHNICAL TOPIC: Energy and power management for large systems

VANADIUM BATTERY ? TEST RESULTS AND USE IN COMBINATION WITH WIND POWER

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The intermittency of power production from wind turbines is an inherent challenge for the integration of the technology. Vanadium batteries offer a solution to this as they facilitate higher levels of wind power penetration in energy systems.

A 15kW/120kWh vanadium battery has been installed at Risø DTU as part of the SYSLAB facility. The battery has been tested and characterized and it has been operated in parallel with an 11kW wind turbine in order to smooth out the wind power production.

The paper will present the results of the tests and the parallel operation with the wind turbine.

The fluctuations in power output from wind turbines are constraining the level of wind power penetration in power systems. At higher penetration levels energy storage becomes an interesting option for smoothing out the power production and keeping the overall system efficiency high. Many energy storage technologies have been developed and investigated over time. During recent years different flow battery technologies have been developed and few of these are now commercially available. One of these, the vanadium redox flow battery, has appeared to be a technology with the potential of playing a role in systems with wind power. This is due claims of the manufacturers including separation of sizing of power and energy capacity, number of cycles it can perform, efficiency, fast response time and simplicity in operation in terms of charging and discharging. At present, vanadium batteries are mostly seen in smaller systems for power backup, but the modular design makes it easy to scale up the units and integrate them in systems with high levels of wind power penetration.

A 15kW/120kWh vanadium redox battery has been installed at Risø DTU as part of the SYSLAB facility. The battery has been operated almost continuously since early 2008 without any faults. Various tests have been executed in order to understand and characterize the unit and its parts (cell stacks, storage, power converter, etc.). The results of the tests give the opportunity to understand the performance of the technology and to make realistic modeling of vanadium battery integration in power systems. The battery has also been operated in parallel with an 11kW wind turbine in order to smooth out the power output.

The paper will present results from the tests, performance characteristics of the battery, and results on the parallel operation of wind turbine and battery.