

Battery Energy Storage Solution - Enhancing the operational flexibility of flexible combined cycle industrial gas turbines

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Abstract

Stable power system operation gets recently more and more under threat as consequence of higher penetration by renewable energies. Wind turbines and photovoltaic inverters do not have rotational inertia to help stabilizing grid frequency. They can't rebuild a grid in case of black-out. Diesel driven gensets cannot contribute to any grid related services as well.

Large, centralized fossil fuel plants - initially foreseen for base load operation - are now requested to ramp much faster, more frequently and act on top of this as spinning reserve generation.

Battery Energy Storage Solutions (BESS) can be used much better for such purposes, especially since their costs have significantly decreased during the last years. Co-locating battery BESS with combined cycle gas turbines (CCGT) can further enhance the start up of CCGTs thus enabling them to provide much faster services such as Enhanced Frequency Regulation (EFR) and Firm Frequency Response (FFR), whilst still being available and running to provide longer duration services such as Short Term Operating Reserve (STOR), secondly as a solution to replace the diesel generator (starter motor) normally used to provide power for black cold start to a CCGT that normally provides services used to rebuild the grid in the event of a black-out, thus providing a much faster restoration service, and further as a resource to support fast ramp up to meet peak demand requirements.

The demand for black-start abilities may increase as well for the above mentioned reasons. Today, only a small percentage of all GT power plant installations are equipped with Diesel gensets for Black Start.

Summarizing it again, BESS can provide a combination of following advantages: Black Start of CCGT, Frequency Control, Stabilization of Voltage, Critical Power, Electrical Islanding, Ramping Control, lower GT minimum load by time shifting and finally spinning reserve.