8th October 2024

The Electricity Authority
Wellington

This submission is for the Topic

Addressing larger voltage deviations and network performance issues in New Zealand's power,

specifically, the two issues of:

Issue 1: Larger voltage deviations on the transmission network, exacerbated by changing patterns of reactive power flows

Issue 2: Inverter-based resources can cause network performance issues

I have experience of operating 2 x 5 MW Distributed Energy Resources (DER) located in the Auckland City region and can confirm that these issues are particularly relevant to daily operations especially for the 5MW DER station - inverter based wind energy converters (WEC).

The consultation paper advises:

2.7. Power system voltage is maintained by balancing the demand for and production of reactive power. Electrical loads consume reactive power, while generation and electrical devices such as capacitor banks, static synchronous compensators (STATCOMs) and static Volt-Amps reactive (VAr) compensators (SVCs) produce reactive power. Some electrical devices (eg, STATCOMs and SVCs) can both produce and absorb reactive power.

Our WEC inverters can be set to either produce or absorb some reactive power.
Typically, absorbing power is more beneficial for us at times of low consumer load on the export line as the removal of the reactive power free's up line space for real power.

Unfortunately, we get charged by the export line owner for removing reactive power as they like to keep some reactive power in their lines to assist's electrical consumers who need reactive power for some of their electrical devices.

Together with the export line owner and with assistance from the Electricity Authority we have been trialling a 11kV pole mounted STATCOM that allow reactive power to removed when we need it and then put back when the lines company consumers need it.

Our initial trials with a 900 kVAR 11kV STATCOM unit is that it is successful in doing this (photo below).

An additional benefit of our STATCOM unit is its ability to smooth out faults in the grid. It does this by rapidly switching between absorbing and producing reactive power to either increase or decrease the voltage of each line individually. This effect increases the reliability of our connection with the grid by preventing unnecessary trips (a historical problem of ours).

The next stage is to integrate the WEC inverters into the reactive power control hardware which will require a closer electronic co-operation between the WEC and export line voltage controllers.

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