05 May 2020

Australian Energy Market Operator

RE: Primary Frequency Response Requirements Document Consultation, 01 April 2020.

Vestas welcomes the opportunity to make a submission to the Australian Energy Market Operator's consultation into Interim Primary Frequency Response Requirements Document.

Vestas is the energy industry's global partner on sustainable energy solutions. We design, manufacture, install, and service wind turbines across the globe, and with +113 GW of wind turbines in 81 countries, we have installed more wind power than anyone else.

Vestas is pleased to submit the following comments and clarification based on below summary:

- **Mandatory underfrequency response**

Automatic access standard requirement for Frequency control	**Recommended PRIMARY FREQUENCY RESPONSE**
(1) The *generating system's power* transfer to the *power system* will not: (ii) decrease in response to a fall in the *frequency* of the *power system* as measured at the *connection point*; and (2) The *generating system* is capable of operating in *frequency response mode* such that it automatically provides a proportional: (ii) increase in *power transfer* to the *power system* in response to a fall in the *frequency* of the *power system* as measured at the *connection point,* sufficiently rapidly and sustained for a sufficient period for the *Generator* to be in a position to offer measurable amounts all market ancillary services for the provision of power system frequency control.	Mandatory underfrequency response where: • (3.4. Response time) an Affected GS should be capable of achieving a 5% change in active power output, within no more than 10 seconds, resulting from a sufficiently large positive or negative step change in frequency greater than the Affected GS' Deadband and less than or equal to 0.5 Hz. • (4.3. Continuity of Response) PFR must remain continuously enabled at the PFR Settings, unless agreed with AEMO, independent of *ancillary services enablement*.

- **Droop**

Automatic access standard requirement for Frequency control	**Recommended PRIMARY FREQUENCY RESPONSE**
(4) (ii) the droop can be set within the range of 2% to 10%.	(3.3. Droop) For all Affected GS, Droop must be set to less than or equal to 5%

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Vestas Clarification:

- On Section "3.4 Response Time", the "5% change in *active power* output, within no more than 10 seconds". Please clarify if the required active power ramp rate is at least 0.005pu /sec.
- Please clarify if spinning reserve becomes a requirement for semi-scheduled generators as this requirement is implied by the Continuity of Response requirement.
- Please clarify if synthetic inertia from wind turbine generators becomes a requirement for under-frequency control. If synthetic inertia is an option, please clarify what is the expected performance during the over-boost period and the recovery period.

Vestas comments:

- The recommended maximum droop amendment of 5%, requires minimum of 40% of P_{max} response for $1\ Hz$ frequency deviation instead of minimum of 20% of P_{max} response for $1\ Hz$ frequency deviation according to the requirements of the Automatic access standard. Therefore, the proposed PFRR doubles the spinning reserve with the maximum allowed droop gain changed from 10% to 5%.
- It may not be economically feasible for renewable generation to operate curtailed to provide large spinning reserve in order to fulfil underfrequency response requirement. It seems to Vestas that the recommended mandatory PFRR serves as a technical push to energy storage in the renewable energy industry.

Vestas recommendations:

- Remuneration for generators providing PFRR services should be considered to ensure the renewable energy project economics are not adversely impacted.
- Keep the adjustable range of droop between 2 and 10% and use 5% as default as some grid connection points may require higher droop than 5%.

Yours sincerely,

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