Transgrid

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New South Wales Synchronous Generation

Interim Advice for System Normal Requirement

14/02/2024

Contents

1. Intent

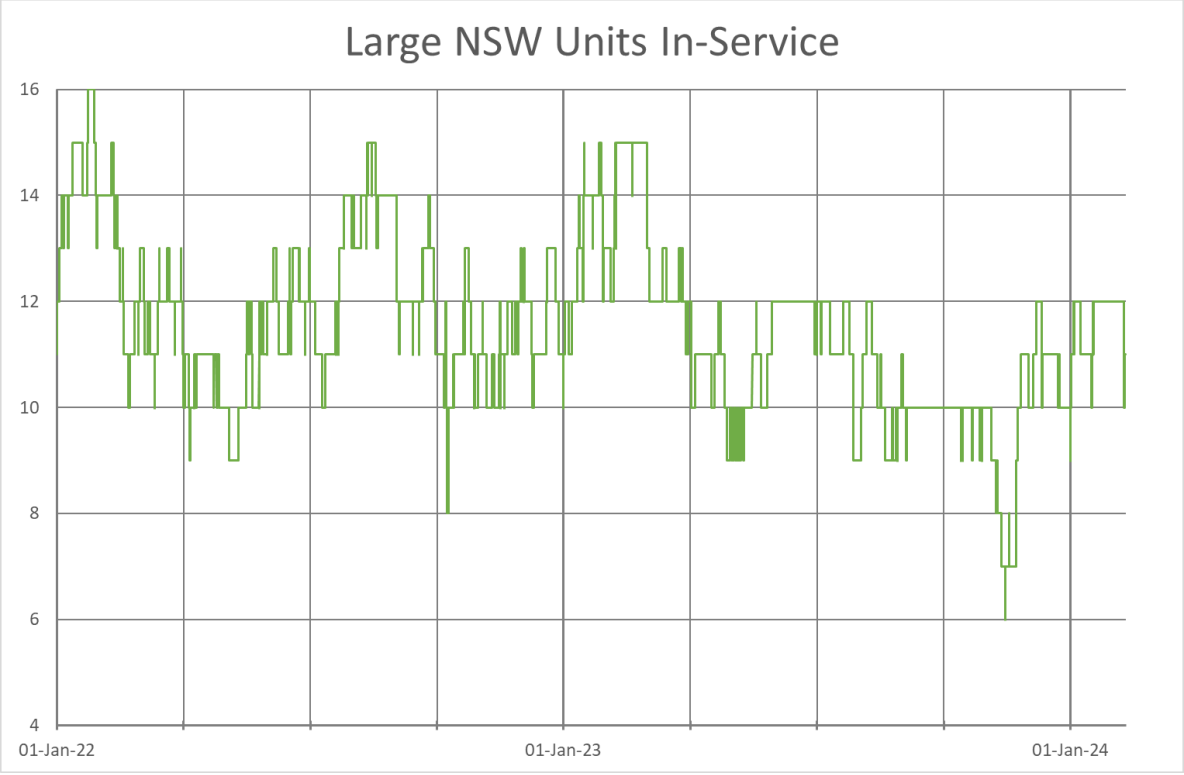
The intent of this report to provide interim advice to AEMO of the contribution of small synchronous generating units to the stable operation and protection of the New South Wales transmission network, and to advise market participants that this advice has been provided to AEMO.

2. Background

An amount of synchronous generation is required to be in service to allow for the stable operation and protection of the New South Wales transmission network. Transgrid and AEMO have jointly determined and agreed that this can be achieved if the equivalent of six large synchronous generators are in service. If the equivalent of six of these generators are in service the network is considered to have enough synchronous generation to be in a satisfactory state. Allowing for a single credible contingency, if the equivalent of seven of these generators are in service, the network is considered to be in a secure state.

Until recently, it could be assumed that sufficient synchronous generation would be constantly in service for the network to be secure. This was mainly due to the 16 large synchronous generators, which provided significant amounts of generation. Four of these units have already retired, and further retirements have been planned. It is no longer assumed that sufficient generation will be in service. As a consequence, market intervention may be required to maintain a secure network. Given the possibility that less than seven large units may be in service, it is prudent to consider the contribution of smaller synchronous generation.

The following graph shows the number of large NSW synchronous generators in service since the first of January, 2022. Notably, this number falls to six for a short period during quarter four of 2023.



When the market provides insufficient synchronous generator for a secure network, AEMO may intervene in the market and direct generation to maintain a secure operating state.

3. Consideration of smaller units

As noted above, six large synchronous units in-service is considered to be satisfactory and seven units in-service is considered to be secure.

Limited studies have been performed to consider the positive impact of smaller synchronous units. The results of the studies provide a value representing a fractional contribution of the smaller units.

Extensive studies are underway, which will result in a different method of consideration. In the interim, the following Table 1 may be used to assess the state of the NSW network. The large thermal units are included with a factor of 1.000 for completeness.

	Location	Units	Equivalent Proportion
Large Units	Bayswater	4	1.000
	Eraring	4	1.000
	Mount Piper	2	1.000
	Vales Point	2	1.000
Small Units	Tallawarra A	1	0.490
	Tallawarra B	1	0.530
	Murray 1	10	0.037
	Murray 2	4	0.036
	Tumut 1	4	0.073
	Tumut 2	4	0.066
	Tumut 3	6	0.101
	Colongra	4	0.355
	Kangaroo Valley	2	0.155
	Bendeela	2	0.086
	Uranquinty	4	0.053

Table 1

If the sum of the equivalent proportion of units in service is greater than or equal to six, then the NSW synchronous generation is considered satisfactory. If this sum remains greater than or equal to six, after consideration of each credible contingency, then the NSW synchronous generation is considered to be secure.

The units only need to be synchronised (not necessarily generating) to provide the equivalent contribution. Units operating as a pump or synchronous condenser (where possible) are considered to be providing the equivalent contribution.

As an example of use, consider that seven large units (and some small units let's say 2 Colongra Units) are running. The network is considered secure. Now consider that one of the large units tripped. NER 4.2.6 compels AEMO to quickly return (as soon as practical and in any case within 30 minutes) the network to a secure operating state. AEMO would consider the contribution of small synchronous machines already in service (2 x 0.355 = 0.71) and utilise the fast response of the other small units to make up the remaining 0.29 equivalence. As an example, this could be achieved by running both Kangaroo Valley units (2 x 0.155 = 0.31), and so the equivalent number of large units in service would be (6 + 0.71 + 0.31 = 7.02), and the network would be considered to be in a secure state.

3.1. References

AEMO 2023 System Strength Report - https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/system-strength-requirements/2023-system-strength-report.pdf?la=en

AEMO 2022 System Strength Report - https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/system-strength-requirements/2022-system-strength-report.pdf?la=en

3.2. Disclaimer

The information contained in this report should only be used for the intended purpose, which is to allow AEMO to determine the adequacy of New South Wales Synchronous Generation for stability and correct operation of protection devices during system normal. It has been published for informational purposes only. It is very important to perform analysis before making any decision based on your circumstances. You should take independent professional advice, or independently research and verify, any information that you find in this report and wish to rely upon, whether for the purpose of making a decision or otherwise.