

Preliminary System Strength Impact Assessments

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Introduction - AEMC Information Sheet

- System Strength in some parts of the power system is decreasing
- Relative stability of power system can reduce with additional asynchronous generation connecting
- Power Electronic generation reliant on strong power system
- Strong power system is one characterised by high fault levels
- The National Electricity Amendment (Managing power system fault levels) Rule 2017 No. 10 (Fault Levels Rule) placed obligations on TNSPs, AEMO and new generators alike in response

The final rule

The key features of the final rule are as follows:
(Taken from the AEMC information sheet –
Managing power system fault levels)

The final rule

- AEMO to develop a system strength requirements procedure from which it can determine the required fault level at key locations in each transmission network necessary for the power system to be maintained in a secure operating state.
- Delegated to TNSP

Minimum Fault Level Nodes

2018 Minimum three phase fault levels

The minimum *three phase fault levels* for 2018 at each *fault level node* are also listed in Table 1.

Table 1 Fault level nodes and minimum three phase fault levels for 2018

Region	Fault Level Nodes	Minimum Three Phase Fault Level (MVA)
South Australia	Davenport 275 kV	1150
	Robertstown 275 kV	1400
	Para 275 kV	2200
Tasmania	George Town 220 kV	1450
	Waddamana 220 kV	1400
	Burnie 110 kV	750
	Risdon 110 kV	1330
	Western Downs 275 kV	2550
		2800

NOTE: minimum fault level does not equate to an available fault level

These fault levels are used when undertaking preliminary system strength impact assessments

The final rule

- Where a system strength shortfall exists, an obligation on TNSPs to procure system strength services needed to provide the fault levels determined by AEMO which services are then enabled by AEMO as needed.
- Currently there are no shortfalls except for in South Australia

The final rule

- AEMO to develop system strength impact assessment guidelines that set out a methodology to be used by network service providers (NSPs) and generators when assessing the impact of a new generator connection on system strength
- What we will discuss today

System Strength Impact Assessment Guidelines



SYSTEM STRENGTH IMPACT ASSESSMENT GUIDELINES

PREPARED BY: Operational Analysis and Engineering, AEMO
VERSION: 1.0
EFFECTIVE DATE: 1 July 2018
STATUS: Final

Approved for distribution and use by:
APPROVED BY: Damien Sanford
TITLE: Executive General Manager

DATE: 29 June 2018



The final rule

- A requirement on new connecting generators to 'do no harm' to the security of the power system, in relation to any adverse impact on the ability to maintain system stability or on a nearby generating system to maintain stable operation.

Preliminary System Strength Impact Assessment

From 1 July 2018, the NER require Connecting NSPs to carry out:

- a Preliminary Assessment under clause 5.3.4B(a)(1) upon receipt of a *connection* enquiry or a request from a *Generator* under clause 5.3.9(c1),
in accordance with these Guidelines.
- Hence, all *connection* enquiries, requests under clause 5.3.9(c1), *applications to connect* or requests under clause 5.3.9 submitted to a Connecting NSP on or after 1 July 2018 are, amongst other things, subject to a *system strength impact assessment*.

Preliminary System Strength Impact Assessment

“The objective of a Preliminary Assessment is to identify, through a relatively simple metric, the likelihood of an *adverse system strength impact* caused by the 4.6.6 Connection”

Preliminary System Strength Impact Assessment

The definition of an “*adverse system strength impact*” can be found in AEMO’s system strength impact assessment guidelines

The NER define *adverse system strength impact* as follows:

An adverse impact, assessed in accordance with the *system strength impact assessment guidelines*, on the ability under different operating conditions of:

- (a) the *power system* to maintain system stability in accordance with clause S5.1a.3; or
- (b) a *generating system* or *market network service facility* forming part of the *power system* to maintain stable operation including following any *credible contingency event* or *protected event*,

so as to maintain the *power system* in a *secure operating state*.

Regardless of the *facility* the definition is directed at, an *adverse system strength impact* will not occur if the 4.6.6 Connection does not adversely impact the operation of the *power system* in a *secure operating state*.

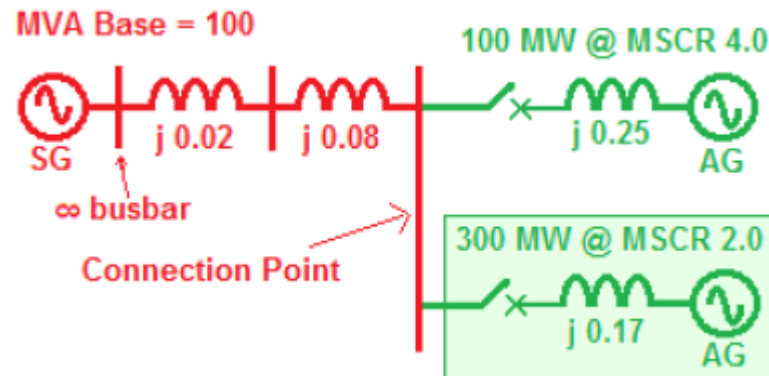
Preliminary System Strength Impact Assessment

- Initial screen using simple, readily derived indices
- Balances the need for meaningful insight against undertaking more rigorous analysis
- Detailed models at this stage may be lacking so uses steady state analysis
- Uses the “MSCR” method

Preliminary System Strength Impact Assessment

1. Calculate fault level at *connection point* with all AG disconnected

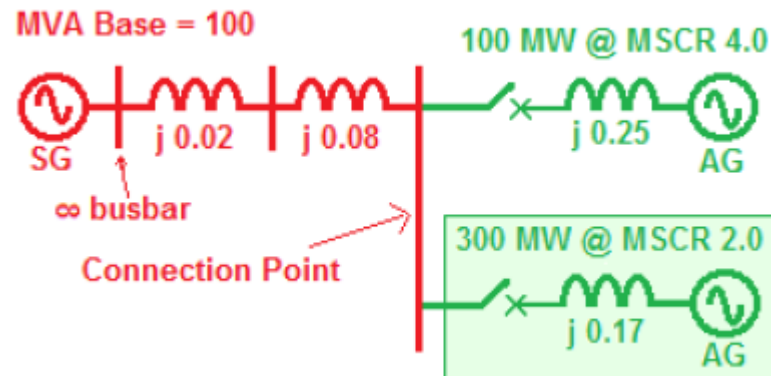
$$1^2 / (j.02 + j.08) \times 100 \text{ MVA} = 1000 \text{ MVA}$$



Preliminary System Strength Impact Assessment

2. Calculate the required fault level (MSCR) for the existing AG

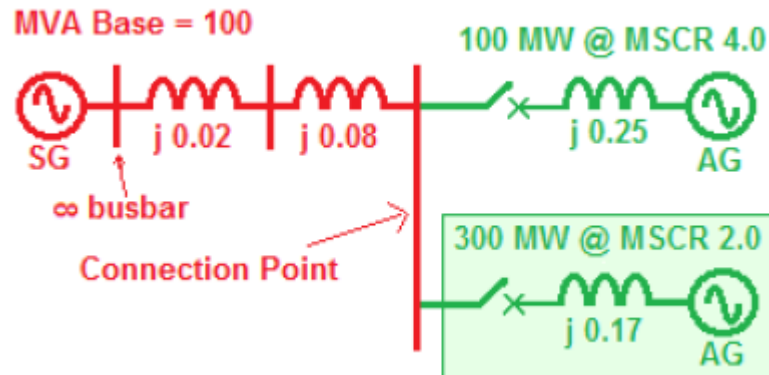
$$(\text{MSCR} \times \text{MW rating}) = 4 \times 100 \text{ MW} = 400 \text{ MVA}$$



Preliminary System Strength Impact Assessment

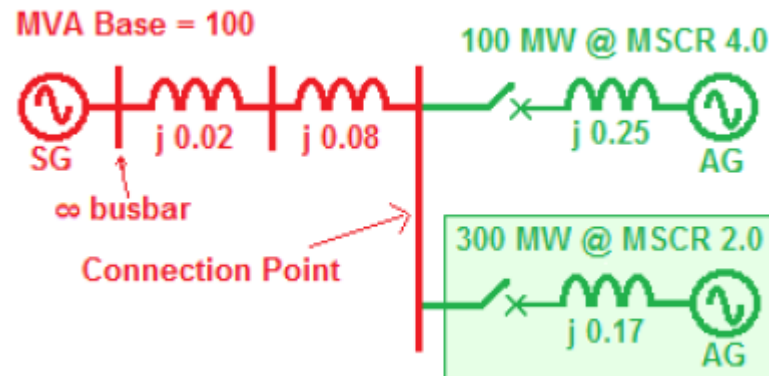
3. Calculate the available fault level (AFL) for the new AG connection

$$1000 \text{ MVA} - 400 \text{ MVA} = 600 \text{ MVA}$$



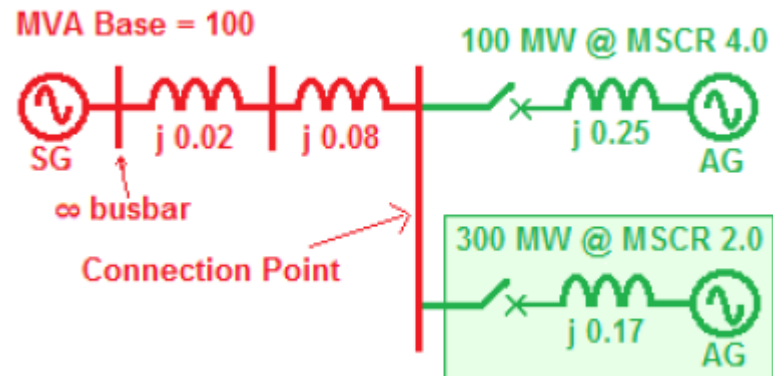
Preliminary System Strength Impact Assessment

4. Calculate prospective minimum ratings of new AG:
 1. AG with MSCR of 4 (AFL/MSCR) = $600/4 = 150$ MW
 2. AG with MSCR of 2 (AFL/MSCR) = $600/2 = 300$ MW

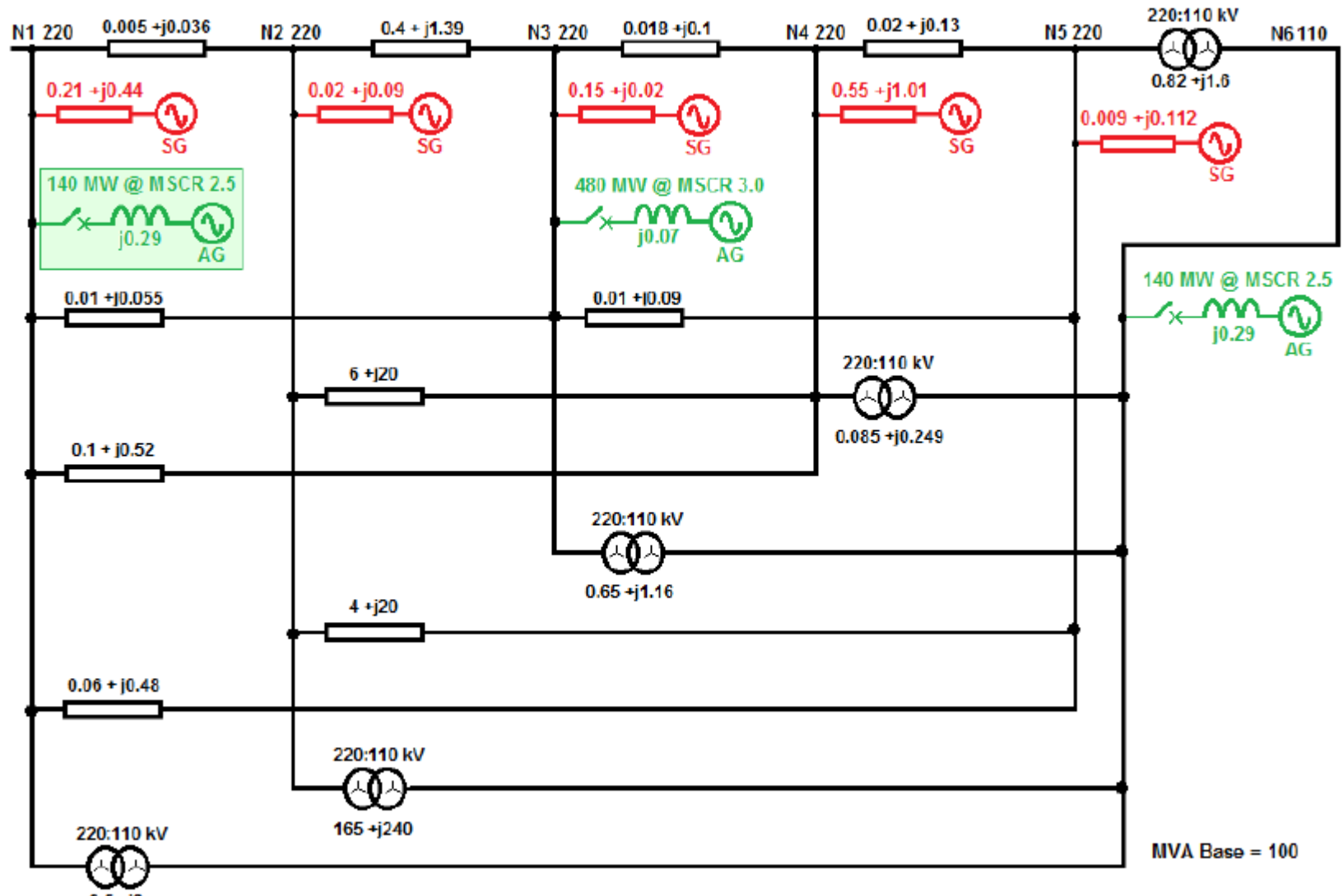


Preliminary System Strength Impact Assessment

This is a straight forward concept when considering a single bus...



Preliminary System Strength Impact Assessment



Results of preliminary assessment

- NSP must advise the results of a Preliminary Assessment within 20 business days of receipt of a connection enquiry or submission under clause 5.3.9(c1) of the NER
- NSP must consult AEMO at least 5 business days prior
- AEMO will respond within 3 business days

Where the NSP concludes that:

- An adverse system impact will exist; or
- Preliminary assessment was inconclusive

A full assessment will be required in an application to connect is made under clause 5.3.4 of the NER

Thank You!