

Ausgrid Register of Embedded Generation Projects

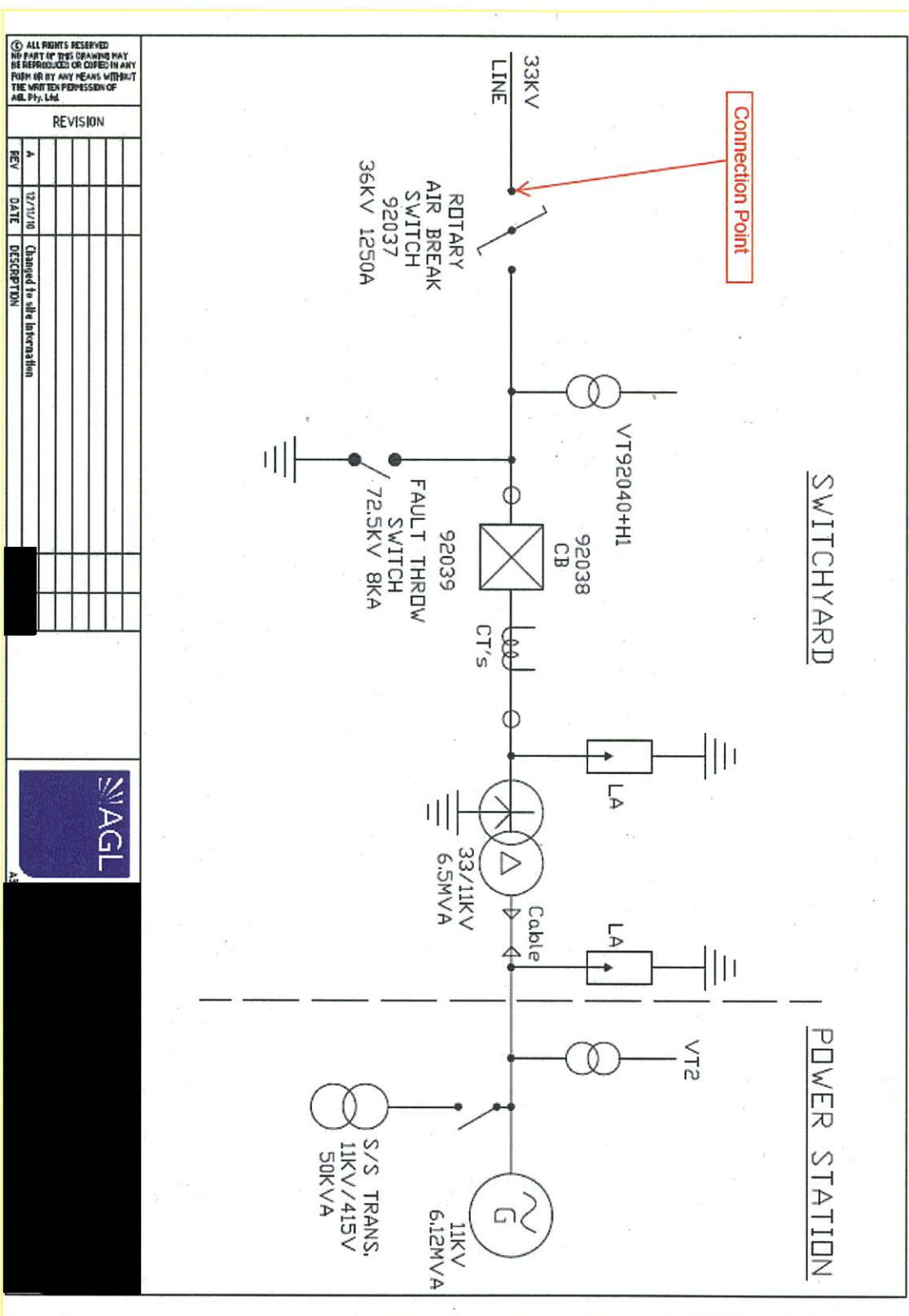
(As at October 2014 - Registered Participants connected during preceding 5 years)

Ref: NER 5.4.5(b)

1. 

1. Technology: Hydro - Gravity, Alstom Synchronous Generating Unit, Type AA 58 VL95/8p
2. Maximum Power: 5.5MW
3. Contribution to fault levels: Three phase fault 400A, Single phase to ground fault 500A
4. Size & rating of the relevant Transformer: 6.5MVA, 33/11kV
5. Single line diagram (*refer to following page*)
6. Protection Systems & Communication Systems (*refer to 'Generating Facilities Performance Standards on subsequent three pages*)
7. Voltage Control and reactive power capability: As per 6 above
8. Connected since 1994, new GCA established in July 2012 and Registered Participant w.e.f. December 2012

Part E: Connection Point Diagram



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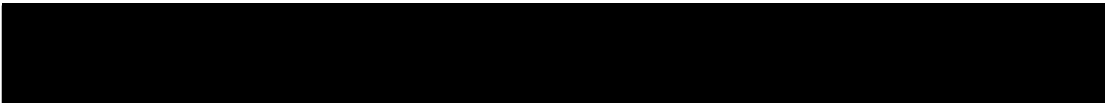
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Schedule 2: Generating Facilities Performance Standards

Note: The following tables include the information AEMO requires to assess compliance with Chapter 5 of the Rules for generators applying for registration. Ausgrid Network may require additional or less information on generator performance standards on a case by case basis, regardless of whether or not the generator is or will be registered.

Part A: Generator Performance Standards



1 INTRODUCTION

Except where otherwise indicated, the *performance standards* described in this document were registered by AEMO under clause 4.14 of the Code, in respect of the following *generating units*:

Registered Generator:



Network Service Provider:

Ausgrid



Name of generating system:



Generating unit designations:

Unit 1

Generating unit Rated MW 5.5 MW
(Generated) (P_{MAX})

Connection point voltage: 33 kV

2 INTERPRETATION

In this document, italicised terms have the meaning given to them in the Code as at the *performance standards commencement date*, and "Rules" means the National Electricity Rules.

3 THE PERFORMANCE STANDARDS

3.1 Reactive Power Capability (S5.2.5.1)

(Deemed standard under Code clause 4.14(h)) The *generating unit* has sufficient *reactive power* capability to maintain the *power factor* between 0.9 lagging and unity for all *loading levels*.

3.2 Quality of Electricity Generated (S5.2.5.2)

Connection to the *distribution network* will not unacceptably degrade the quality of *supply*.

- (a) The maximum voltage fluctuation will be within the limits $\pm 2\%$ of nominal rated voltage and will not exceed the "Threshold Limit of Perceptibility" indicated in figure 1 of AS 2279, Part 4.
- (b) Harmonic distortion will be limited to one third of the total and individual harmonic limits required in AS 2279 – Part 2.
- (c) Voltage unbalance factor from all sources at the *connection point* will not exceed 1% at 33 kV.

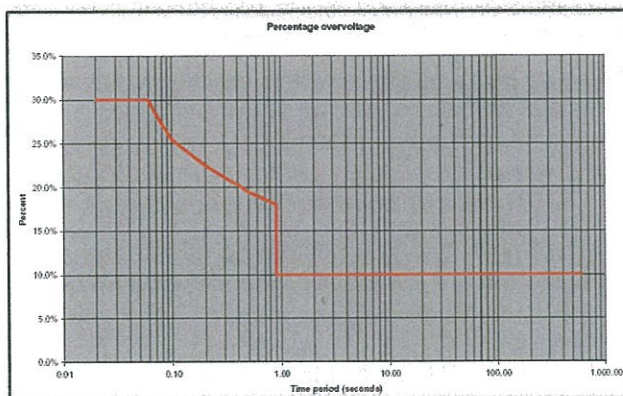
3.3 Response to Disturbances (S5.2.5.3)

Each *generating unit* is capable of continuous uninterrupted operation during the occurrence of:

- (1) (Determined under *Rules* clause 4.16.5(c)(3)) *power system frequency* within the limits and bands for periods not longer than the corresponding times specified in the following table:

Frequency range (Hz)	Duration
47 to 49	2 seconds
51 to 52	2 seconds
49 to 49.5	8 minutes
50.5 to 51	8 minutes
49.5 to 50.5	continuous

- (2) (Determined under *Rules* clause 4.16.5(c)(3)) *connection point* voltage at any level:
 - (i) within the range of 33 kV +/- 10% for any duration; and
 - (ii) above 33 kV for the time period shown on the following graph corresponding to the percentage of voltage above 33 kV;



- (3) (Deemed under *Code* clause 4.14(h)) the *voltage* dip caused by a *transmission system* fault which causes *voltage* at the *connection point* to drop to zero for up to 0.175 seconds in any one phase or combination of phases, followed by a period of ten seconds where *voltage* may vary in the range 80-110 percent of the nominal *voltage*, and a subsequent period of three minutes in which the *voltage* may vary within the range 90-110 percent of the nominal *voltage*.

3.4 Partial Load Rejection (S5.2.5.4)

Each *generating unit* is capable of continuous uninterrupted operation during and following a *loading level* reduction directly imposed from the *power system* in less than 10 seconds from a fully or partially loaded condition provided that:

- the *loading level* reduction is less than 5 percent of the *generating unit's nameplate rating*, and
- the *loading level* remains above 0 MW.

3.5 Protection From Power System Disturbances (S5.2.5.8)

(Determined under *Rules* clause 4.16.5(c)(4))

The *generating unit* may be automatically *disconnected* from the *power system* in response to abnormal conditions arising from the *power system*, provided that the *protection system* or *control system* does not *disconnect* the *generating unit* for conditions under which it must continuously operate or must withstand under a provision of the *Rules*.

Each *generating unit* has protection for the following conditions:

- (a) stator voltage above 1.09 per unit for 2 seconds;
- (b) frequency below 49 Hz for 2 seconds; and
- (c) frequency above 51 Hz for 2 seconds.

3.6 Protection That Impacts on Power System Security (S5.2.5.9)

(Deemed under *Code* clause 4.14(h))

Each *generating unit* has primary *protection systems* to disconnect from the *power system* any faulted element within the protection zones that include the *connection point*, the *generating unit* stator winding or any *plant connected* between them, as necessary to prevent *plant* damage and meet stability requirements.

Each primary *protection system* has sufficient redundancy to ensure that a faulted element within its protection zone is disconnected from the *power system* within the applicable *fault clearance time* with any single protection element (including any communications facility upon which that *protection system* depends) out of service.

Breaker fail protection systems are provided to clear faults that are not cleared by the circuit breakers controlled by the primary *protection system*.

3.7 Asynchronous Operation (S5.2.5.10)

Each *synchronous generating unit* has a *protection system* comprising an impedance based pole slip relay to promptly disconnect it in the event of pole slipping.

3.8 Frequency Control (S5.2.5.11)

Not applicable.

3.9 Stability (S5.2.5.12)

(Deemed under *Code* clause 4.14(h)) The *excitation control system* of the *generating unit* is capable of maintaining adequate *generating unit* stability under all operating conditions.

3.10 Excitation Control System (S5.2.5.13)

(Deemed under Code clause 4.14(h))

Each *generating unit* is adequately damped and will not remain in oscillation with respect to the remainder of the *power system* with a frequency of oscillation more than 2.5 Hz or less than 0.1 Hz.

The *generating unit's excitation control system*:

- (a) provides continuous *voltage* regulation to within 0.5 percent of the selected setpoint value at all operating points within generator capability;
- (b) provides reactive current compensation settable for boost or droop; and
- (c) is capable of providing a ceiling excitation voltage at least 1.6 times the excitation voltage required to achieve maximum excitation continuous rating at nominal voltage.

The *excitation control system* performance is as follows:

Performance Item	Performance standard
Time for field voltage to rise from rated voltage to minimum excitation ceiling voltage following the application of a short duration impulse to the voltage reference (see note 1).	0.5 sec maximum
Settling time with the <i>generating unit unsynchronised</i> following a disturbance equivalent to a 5 percent step change in the sensed <i>generating unit</i> terminal voltage (see note 2).	2.5 sec maximum
Settling time with the <i>generating unit synchronised</i> following a disturbance equivalent to a 5 percent step change in the sensed <i>generating unit</i> terminal voltage (met at all operating points within the <i>generating unit</i> capability) (see note 2).	5.0 sec maximum
Settling time following any disturbance which causes an excitation limiter to operate (see note 2).	7.5 sec maximum

Notes:

- 1. Rated field voltage is that voltage required to give nominal *generating unit* terminal voltage when the *generating unit* is operating at its maximum continuous *nameplate rating*. Rise time is the time taken for the field voltage to rise from 10 percent to 90 percent of the increment value.
- 2. Settling time is the time for the *generating unit* terminal voltage to settle to and remain within a band of the final value plus or minus 10 percent of the increment value.

3.11 Remote Monitoring-(S5.2.6.1)

Not applicable.

3.12 Auxiliary Transformers (S5.2.8)

Not applicable.

3.13 Fault Level (S5.2.9)