Detailed Enquiry Form – Chapter 5

27.04.18

Detailed Enquiry Form

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UE's Detailed Enquiry form for registered generators (>5MW) are an extraction and combination of the National Electricity Rules (NER) Chapter 5, Schedule 5.5 and AEMO's Setting Data Sheet spreadsheet. Where applicable, other elements of the NER Schedule 5 and its sub-Schedules would also apply. The Connection Applicant shall consult the latest versions of the following documents for additional information and complete the AEMO data excel spreadsheet template. These are:

- The National Electricity Rules (NER) with attention being drawn to Chapter 5, Schedule 5.

AEMO documents:

- Connecting New Generation – A Process Overview (Document number: 0110-0117 v1.0, 15 April 2011).
- Data and Model Requirements For Generating Systems of Less Than 30MW (28 June 2013).
- Technical Information Requirements for Generator Connections (1 July 2012).
- Guidelines for Assessment of Generator Proposed Performance Standard v1.0 (20 Dec, 2011).
- Generating System Model Guidelines (Document number: 118-0009 v1.1, 29 February 2009).
- Generating System Design Data Sheets and Generating System Setting Data Sheet (Document number: 118-0010 v1.0, 29 February 2008).
- Checklist of Model Data Requirements for New Connections And Planned Alterations (Document number: 0110-0033).
- Generating System Design Data Sheet and Generating System Setting Data Sheet (Document number: 0118-0009, Excel Spread Sheet). This spreadsheet is to be downloaded from AEMO and populated. AEMO itself will seek these as part of its registration process.

AEMO web link: http://www.aemo.com.au/

Attention is drawn to Tables 2-1 and 3-1 extracted from the AEMO document titled: Data And Model Requirements For Generating Systems Less Than 30MW. These tabulate the data type category and requirements. UE shall match AEMO's requirements in all applicable criteria for the Connection Applicant to address when pursuing embedded generator connection within UE's network.

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Table 2-1: AEMO's data and model requirements

Requirements	Generating System Size			
	≤ 5MW	> 5 MW & ≤ 15 MW	> 15 MW & < 30 MW	≥ 30 MW
Data Sheets - transmission-connected generating system	S, D, R1 and R2[1]	S, D, R1 and R2[1]	S, D, R1 and R2[1]	S, D, R1 and R2
Data Sheets - distribution-connected generating system	S only[7]	S and D only[7]	S, D and R1[6]	S, D, R1 and R2
Releasable User Guide	Required[8]	Required	Required	Required
Dynamic Model [2]	Generic or Detailed[3] [8]	Generic or Detailed[3]	Generic or Detailed[3]	Detailed [4]
Model source code	Exempted / Provide if available [9]	Exempted / Provide if available	Exempted / Provide if available	Required
Model confirmation tests	Self-compliance unless required by NSP[5] [8]	Self-compliance unless required by NSP[5]	Required [5]	Required
R2 Tests	Required for transmission connected plant only[1] [8]	Required for transmission connected plant only[1]	Required for transmission connected plant only[1]	Required

S = Standard Planning Data

D = Detailed Planning Data

R = Registered Data

Table 3-1: Summary of data and model requirements under the Rules

REQUIREMENT	TRANSMISSION-CONNECTED			DISTRIBUTION-CONNECTED		
	>30MW	=30MW	<30MW	>30MW	=30MW	<30MW
Single generating unit						
• Design data[1]	YES	YES	YES	YES	Reduced[2]	Reduced[2]
• Model – block diagram	YES	YES	YES[3]	YES	YES	Not explicit[4]
• Model – source code	YES	YES	Not explicit[4]	YES	YES	Not explicit[4]
• Model – RUG[6]	YES	YES	Not explicit[4]	YES	YES	Not explicit[4]
Generating system (2 or more generating units)						
• Design data[1]	YES	YES	YES	YES	YES[5]	Reduced[2]
• Model – block diagram	YES	YES	YES[3]	YES	YES	Not explicit[4]
• Model – source code	YES	YES	Not explicit[4]	YES	YES	Not explicit[4]
• Model – RUG[6]	YES	YES	Not explicit[4]	YES	YES	Not explicit[4]

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The following fields constitute the typical data to be submitted to UE during the Detailed Enquiry phase. These data requirements generally typify synchronous machine models (as the most commonly envisaged generating technology above 5MW). The Connection Applicants shall consult the relevant AEMO documents to identify the most appropriate Generating Unit technology data requirements and complete the Standard and Detailed data details (AEMO data spreadsheet).

Should the Connection Applicant formally commit to the project post Detailed Enquiry, detailed engineering studies in consultation with the Connection Applicant could be specified by UE. These studies would be undertaken by the Connection Applicant and submitted as part of the Application To Connect process. Where applicable, AEMO requirement may compliment and or supersede UE's requirements.

Engineering studies may include:

- Load flow studies.
- Voltage fluctuation studies detailing adjacent HV & LV buses impact
- Protection Studies.
- Fault level contribution studies detailing impact to adjacent connection points.
- Reverse power flow compatibility checks.
- Stability studies

It is highlighted that under the Electrical Distribution Code (EDC), generation capacity above 10MW shall comply with the NER requirements on certain criteria as if a 30MW system.

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Connection Applicant (Embedded Generating Unit Owner/Proponent)	
Business name:	
ABN:	
Contact name:	
Address:	
Telephone number:	
E-mail address:	
Connection Applicant acting and working on behalf of the above Proponent (Agent).	
Business name:	
ABN:	
Contact name:	
Address:	
Telephone number:	
E-mail address:	
Connection Applicant's (Owner) confirmation the nominated agent is acting on their behalf for the connection process. (Submit the owner's confirmation statement, letter or email to UE).	

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Commercial Information	
Does the Generating unit seek to provide non-network support of published network constraint? (Y/N)	
Is the Generating unit exempt from AEMO registration (less than 5MW)? (Y/N)	
Is the Generating unit to be registered as a Small Generator Aggregator (SGA) with AEMO? (Y/N)	
Is the Generating unit to be: Market or non-market	
Is the Generating unit to be: Scheduled, semi-scheduled or non-scheduled dispatch.	
Purpose of Generating unit and envisaged operating date? (What is the functional intent of the Generating unit: demand off-set, power export, district power system, etc...)	

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Additional General Information

Additional General Material	S	D	R1	R2	Connection Applicant to Complete
Conceptual Single Line Diagram (SLD) of proposal		•			
Proposed Connection Point to utility network		•			
Connection Point Voltage (V)		•			
Provide evidence that a generator licence has been issued by the Essential Services Commission (or provide a suitable exemption)		•			
Provide evidence that the generator is registered with AEMO (or provide a suitable exemption)		•			
Drawings and maps showing generator installation site		•		•	
Load schedule with calculations showing derivation of diversified maximum demand if the load is not currently serviced by the network and demand during construction (table)		•			
Maximum Net export with consideration of above load over a 15 minute metering interval based on calculation and measurement (MW and MVA)		•		•	
Maximum real and reactive power transfer capability required at the point of connection for real power flow in either direction		•			
Description and nature of any disturbing load/device or power compensation system (if any). (e.g. Power Factor Correction, capacitor bank, large motors, SVC, STATCOM etc…)		•			

Network and Plant Technical Data of Equipment at or near the Connection Point

Network and Plant Technical Data of Equipment	S	D	R1	R2	Connection Applicant to Complete
Voltage Rating					
Nominal voltage (kV)	•	•			
Highest voltage (kV)		•			
Insulation Co-ordination					
Rated lightning impulse withstand voltage (kVp)		•			
Rated short duration power frequency withstand voltage (kV)		•			
Surge arrestor type and specifications (text)		•			

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Rated Currents for Each Component					
Circuit maximum continuous current rating(A)	•	•			
Circuit maximum cyclic current rating (A)		•	•		
Rated short time withstand current (kA)		•			
Rated short time withstand current maximum time (sec)		•			
Ambient conditions under which above ratings apply	•	•			
Earthing					
Generator installation earthing method and impact on network earthing system (text description)	•	•			
Earth grid rated current (kA)		•			
Earth grid rated current maximum time (sec)		•			
Insulation Pollution Performance					
Minimum total creepage (mm)		•			
Pollution level (level of IEC 815)		•			
Controls					
Remote controls and data transmission arrangements (text)		•			
Metering Provided By Customer					
Metering service provider (text)		•			
Meter class / classification		•			
Current transformer winding ratios (A/A)		•			
Voltage transformer winding ratios (V/kV)		•			
Measurement transformer test certification details (text)			•		
Network Configuration					
Operation Diagrams showing the electrical circuits of the existing and proposed main Facilities within the Registered Participant's ownership including busbar, phasing and earthing arrangements, switching facilities and operating voltages (single line diagrams).	•	•	•		
Impedance Of All Plant					
Synchronous, transient and sub transient positive, negative and zero sequence resistance and reactance for synchronous generators (% on 100MVA base)	•	•	•		

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Positive, negative and zero sequence series resistance and reactance for all other plant including transformers, cables, reactors etc (% on 100MVA base)		•	•		
Shunt susceptance for each item of plant including cables (% on 100MVA base)		•	•		
Mutual coupling between physically adjacent elements if significant (% on 100MVA base)		•	•		
Short Circuit Current Infeed To The Network					
Maximum generator 3-phase short circuit infeed current including infeeds from generating units connected to the Registered Participant's system, calculated by method of AS3851-1991 (kA)	•	•	•		
Site total induction and synchronous motor 3 phase contribution at fault clearance (kA sym)		•			
Site total induction and synchronous motor asymmetrical peak contribution (kAp)		•			
Total infeed current at the instant of fault including contribution of induction motors (kA)		•	•		
Minimum zero sequence impedance of the Registered Participant's network at the connection point (% on 100MVA base)		•	•		
Minimum negative sequence impedance of the Registered Participant's network at the connection point (% on 100MVA base)		•	•		
Technical Details Of The Generating Units					
Provision of information in accordance with the Generating System Design Data Sheets and Generating System Setting Data Sheets published by AEMO (NEMMCO) dated 29/02/2008	•	•	•	•	
Provision of information in accordance with the Generating System Model Guidelines published by AEMO (NEMMCO) dated 29/02/2008	•	•	•	•	
Power Transformer					
Nominal voltage ratio (kV : kV)	•	•			
Tapping range (buck % - boost %)		•			
Vector group (text)	•	•			
Natural cooling nameplate rating (MVA)	•	•			
Forced cooling nameplate rating (MVA)	•	•			
Saturation curve (diagram)			•		
Switchgear					

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Manufacturer and model numbers for circuit breakers, switches and isolators (text)		•			
Reactive Compensation					
Single line diagram of shunt capacitor bank (diagram)	•	•			
Location and rating of individual shunt capacitors (MVAr)	•	•			
Capacitor bank capacitance (μF)		•			
Size of capacitor bank series reactor (mH)		•			
Equivalent series resistance of capacitor bank (Ω)		•			
Single line diagram of shunt reactors (diagram)	•	•			
Location and rating of individual shunt reactors (MVAr)	•	•			
Inductance of shunt reactor (mH)		•			
Details of special controls such as point on wave switching		•			

Network Plant, Secondary Design and Apparatus Setting Data

Primary Plant & Secondary Design Setting Data	S	D	R1	R2	Connection Applicant to Complete
Protection Data For Protection Relevant To The Connection Point					
Protection and control design report (detailed report including control and protection settings). This report shall list every network access standard and shall explain how the generator complies. (report)		•	•		
Anti-islanding protection (report)		•	•		
Protection schedule / block diagram showing all protection elements on a single line diagram (diagram)		•	•		
Control and communications block diagram (diagram)		•	•		
Interface hardware and communication protocols between the DNSP network and the Generator for all protection, control and monitoring.		•	•		
Protection grading curves and minimum grading margins between the generator installation and the DNSP network protection.		•	•		
Data transmission arrangements for AEMO		•	•		
Inspection & Test Plan (ITP) report with results from all commissioning tests			•	•	
On Load Tap changer (OLTC)					

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Regulated bus (text)		•			
Method of control such as independent, master/follower… (text)		•			
Time delay settings for definite time or inverse time		•	•		
Shunt Reactor And Capacitor Bank Control					
Method of switching (text)	•				
Details of automatic control logic such that operating characteristics can be determined (text)		•	•		

Generator Design Data Sheet (Synchronous Machines)

Generator Design Data Sheet	Unit	Connection Applicant to Complete
Rated terminal voltage - Vt	kV	
Nameplate rating	MW	
Rated power factor at Vt		
Rated capability	MVA	
Ambient temperature basis for ratings	Deg. C	
If site conditions require any limits		
Site maximum continuous output - Pmax	MW	
Site minimum continuous output - Pmin	MW	
Maximum export reactive power at Pmax	MVAr	
Maximum export reactive power at Pmin	MVAr	
Maximum import reactive power at Pmax	MVAr	
Maximum import reactive power at Pmin	MVAr	
Inertia constant – Generator	MWs	
Inertia constant – Prime mover/Gearbox	MWs	
Number of poles		
Rated slip	%	Not applicable
Short circuit ratio		
Rated stator current at Vt	A	
Rated rotor current at Vt - Ir	A	

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Rotor voltage for Ir	V	
Base for following impedances	MVA	
Stator resistance	%	
Stator leakage reactance	%	
Stator leakage reactance unsaturated	%	Not applicable
Stator leakage reactance at Vt	%	Not applicable
Negative sequence resistance	%	Not applicable
Negative sequence reactance	%	Not applicable
Negative sequence impedance	%	
Zero sequence resistance	%	Not applicable
Zero sequence reactance	%	Not applicable
Zero sequence impedance	%	
Direct axis unsaturated synchronous reactance	%	
Direct axis unsaturated transient reactance	%	
Direct axis unsaturated sub-transient reactance	%	
Quadrature axis unsaturated synchronous reactance	%	
Quadrature axis unsaturated transient reactance	%	
Quadrature axis unsaturated sub-transient reactance	%	
Iron loss resistance (referred to stator)	%	Not applicable
Magnetizing reactance unsaturated (referred to stator)	%	Not applicable
Magnetizing reactance at Vt (referred to stator)	%	Not applicable
Rotor resistance at rated slip (referred to stator)	%	Not applicable
Rotor leakage reactance unsaturated (referred to stator)	%	Not applicable
Rotor leakage reactance at Vt (referred to stator)	%	Not applicable
Direct axis open circuit transient time constant	S	
Direct axis open circuit sub-transient time constant	S	
Quadrature axis open circuit transient time constant	S	
Quadrature axis open circuit sub-transient time constant	S	

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Generator 3 phase short circuit (calculated AS3851) – at fault clearance	kA sym	
Generator 3 phase short circuit (calculated AS3851) – after decrement	kA sym	
Decrement period for reduced 3 phase fault	sec	
Generator asymmetrical peak contribution	kAp	
Generator winding pitch		
References to diagrams providing the following data		
Capability chart		
Open circuit characteristic		
Short circuit characteristic		
Zero power factor curve		
Magnetising curve (voltage versus current)		Not applicable
Speed (slip) versus torque (power) curves		Not applicable
Equivalent circuit diagram		Not applicable