



Powerlink
QUEENSLAND





Please direct Transmission Annual Planning Report enquiries to:

Stewart Bell
Group Manager Strategy and Planning
Investment and Planning Division
Powerlink Queensland

Telephone: (07) 3860 2374

Email: sbell@powerlink.com.au

Disclaimer: While care is taken in the preparation of the information in this report, and it is provided in good faith, Powerlink Queensland accepts no responsibility or liability for any loss or damage that may be incurred by persons acting in reliance on this information or assumptions drawn from it.

Transmission Annual Planning Report Addendum 2016

This document should be read in conjunction with Powerlink's 2016 Transmission Annual Planning Report, in particular, Chapters 5 and 7.

Introduction

Powerlink has introduced a new chapter (Chapter 7) in its 2016 Transmission Annual Planning Report (TAPR) which presents indicative capacity information at selected 132kV and 110kV connection points in its transmission network. This addendum to the 2016 TAPR has been compiled to raise awareness of the location of existing generation. It provides further information on the impact of new generators locating in close proximity (electrically) to existing generation, in particular, the potential for congestion to occur in the transmission network.

Congestion occurs when the incremental increase in the amount of electricity that can flow over a particular line or other transmission system element is constrained by physical or system limitations, usually reflected by equipment ratings. New (and existing) generation connecting into areas with existing constraints and low network capability are at risk of being constrained. Existing network constraints are described in Chapter 5 of the 2016 TAPR.

Table 5.1 in Chapter 5 of the TAPR presents the existing and committed transmission connected generation and scheduled embedded generators connected to Powerlink's transmission network. Table 5.1 is reproduced in this addendum for ease of reference.

Network capacity for new generation

Powerlink has assessed the ability of various locations across the existing transmission network to connect additional generation capacity without significant network congestion emerging. This section provides a broad overview of the results of this assessment. Interested parties are invited to use this data as a first pass to facilitate high level decision making. The data presented here is not exhaustive, and is not intended to replace the existing procedures and processes that must be followed to access Powerlink's transmission network.

Locations assessed for generation connection capacity were selected based broadly on distance from metropolitan load centres. Locations close to major cities were considered unlikely to host a large renewable energy connection, and were excluded from the assessment. In addition, plant operating at 275kV (and higher) were excluded from this study as they can generally accommodate significant levels of generation. The approach used to establish the available capacity at the selected sites was as follows:

- A notional generator was placed sequentially at each of the selected locations and its output was gradually increased, while contributions from other generation sources at that location were set to zero. The capacity of the location was established when either:
 - the loss of a network element caused an overload of one or more adjacent elements; or
 - the size of the notional generator connection exceeded the network strength¹.

¹ Network strength is measured through the fault level and short circuit ratio in an area.

Addendum issued August 2016

The results of the assessment are shown in Table 7.1

Table 7.1 Indicative connection point capacity limits in the existing transmission network²

132kV and 110kV Substation Connection Nodes Assessed			Indicative Connection Point Capacity Limit
Baralaba	Egans Hill	Norwich Park	up to 50MW
Biloela	Grantleigh	Oonooie	
Cardwell	Ingham South	Peak Downs	
Coppabella	Innisfail	Proserpine	
Dingo	Kamerunga (1)	Turkinje	
Edmonton	Moura		
Alligator Creek	Collinsville North	Pandoin	between 50MW and 150MW
Bluff	Dan Gleeson	Rocklands	
Bowen North	Dysart	Strathmore	
Bulli Creek	Kemmis	Tangkam (1) (2)	
Burton Downs	Mackay (1)	Tully	
Chalumbin (1)	Moranbah South	Wandoo	
Chinchilla	Mt. McLaren	Woree	
Clare South (1)	Newlands		between 150MW and 400MW
Alan Sheriff	Larcom Creek (1)	Pioneer Valley	
Blackwater	Lilyvale (1)	Ross	
Bouldercombe	Middle Ridge	Teebar Creek	
Callemondah	Moranbah	Townsville South (1)	
Columboola (1)	Nebo	Woolooga	
Gin Gin	Palmwoods	Yabulu South (1)	
Blackstone	Calliope River (1)	Gladstone South	potentially greater than 400MW

Notes:

- (1) Transmission connected, scheduled or significant non-scheduled embedded generation, either currently exists or is committed at these connection points.
- (2) Network congestion has occurred historically at this location during periods of material local generation dispatch. Please refer to Chapter 5 of the 2016 TAPR for further information.

The findings indicate that the Queensland transmission network is sufficiently strong, and well positioned to accommodate sizeable quantities of new generation without encroaching stability limits. These results are encouraging, particularly given the volume of interest shown in renewable energy projects in Queensland.

² 275kV and 330kV connections were excluded from this assessment on the basis that they can generally accommodate significantly higher levels of generation.

Key points to note:

- Generation opportunities presented in this section are not cumulative. If a new generator connects to the network, it will likely impact the capacity of other areas in the network. Similarly, changes to the existing network arrangement will impact transfer limits and consequently, available capacity. Network capacity must be reassessed each time the network topology changes or a prospective generator commits.
- The capacity limits are based primarily on thermal limits and network strength³, with the assumption that the proposed generation facility will comply with the NER's automatic access standard for reactive power dispatch. A formal connection enquiry could trigger an assessment of other stability limits, including the potential for network congestion.
- While some areas may appear to have restricted capacity, there may be low cost solutions available to accommodate much larger capacities. Fast run-back schemes are often used to curtail generation to avoid breaching thermal limits. The capacities stated in Table 7.1 are therefore not absolute. They are presented as a guideline, and starting point for further discussions.
- The indicative connection point capacity limits do not consider the impact of the varying power system behaviours. Connection location and generator bidding strategy play an important role in determining dispatch merit order and can lead to constrained generation, regardless of which generator connected first. Existing generation could be constrained off in future due to new connections.

³ Network strength is measured through the fault level and short circuit ratio in an area. Fault level is the maximum current expected to flow in response to a short circuit at a given point in the power system. A project-specific measurement of system strength for a generator connection is the Short Circuit Ratio (SCR), which is the ratio of the power system fault level at the proposed connection point to the rated generator connection. Both the minimum fault level and the minimum SCR are important values in establishing the limit of an asynchronous generator connection (such as wind or solar).

Table 5.1 Available generation capacity

Existing and committed plant connected to the Powerlink transmission network and scheduled embedded generators are shown in Table 5.1 (TAPR 2016 – available generation capacity) below.

Location	Available capacity MW generated (1)					
	Winter 2016	Summer 2016/17	Winter 2017	Summer 2017/18	Winter 2018	Summer 2018/19
Coal-fired						
Stanwell	1,460	1,460	1,460	1,460	1,460	1,460
Gladstone	1,680	1,680	1,680	1,680	1,680	1,680
Callide B	700	700	700	700	700	700
Callide Power Plant	900	900	900	900	900	900
Tarong North	443	443	443	443	443	443
Tarong	1,400	1,400	1,400	1,400	1,400	1,400
Kogan Creek	744	730	744	730	744	730
Millmerran	852	760	852	760	852	760
Total coal-fired	8,179	8,073	8,179	8,073	8,179	8,073
Combustion turbine						
Townsville (Yabulu) (2)	243	234	243	234	243	233
Mt Stuart (3)	419	379	419	379	419	379
Mackay (4)	34	34	34	–	–	–
Barcaldine (2)	37	34	37	34	37	34
Yarwun (5)	160	155	160	155	160	155
Roma (2)	68	54	68	54	68	54
Condamine	144	144	144	144	144	144
Braemar 1	504	471	504	471	504	471
Braemar 2	519	495	519	495	519	495
Darling Downs	633	580	633	580	633	580
Oakey (6)	340	282	340	282	340	282
Swanbank E (7)	–	–	385	385	385	385
Total combustion turbine	3,101	2,862	3,486	3,213	3,452	3,212
Hydro electric						
Barron Gorge	66	66	66	66	66	66
Kareeya (including Koombuloomba) (8)	93	93	93	93	93	93
Wivenhoe (9)	500	500	500	500	500	500
Total hydro electric	659	659	659	659	659	659
Sugar mill						
Invicta (8)	34	0	34	0	34	0
Total all stations	11,973	11,594	12,358	11,945	12,324	11,944

Notes:

- (1) The capacities shown are at the generator terminals and are therefore greater than power station net sent out nominal capacity due to station auxiliary loads and stepup transformer losses. The capacities are nominal as the generator rating depends on ambient conditions. Some additional overload capacity is available at some power stations depending on ambient conditions.
- (2) Townsville 66kV component, Barcaldine and Roma power stations are embedded scheduled generators. Assumed generation is accounted in the transmission delivered forecast.
- (3) Origin Energy has advised AEMO of its intention to retire Mt Stuart at the end of 2023.
- (4) Stanwell Corporation has advised AEMO of its intention to retire Mackay GT at the end of financial year 2016/17.
- (5) Yarwun is a non-scheduled generator, but is required to comply with some of the obligations of a scheduled generator.
- (6) Oakey Power Station is an open-cycle, dual-fuel, gas-fired power station. The generated capacity quoted is based on gas fuel operation.
- (7) Swanbank E has been placed into cold storage until 1 July 2017.
- (8) Koombooloomba and Invicta are transmission connected non-scheduled generators.
- (9) Wivenhoe Power Station is shown at full capacity (500MW). However, output can be limited depending on water storage levels in the dam.



Contact us

Registered office 33 Harold St Virginia
Queensland 4014 Australia
ABN 82 078 849 233

Postal address: GPO Box 1193 Virginia
Queensland 4014 Australia

Telephone (+617) 3860 2111
(during business hours)

Internet www.powerlink.com.au

Social media    