

Geoff Brown & Associates Ltd

**REVIEW OF WESTERN POWER'S APPLICATION
FOR A TECHNICAL RULES EXEMPTION FOR
BYFORD PHOTOVOLTAIC SOLAR FARM**

Prepared for

ECONOMIC REGULATION AUTHORITY

Final

18 December 2014

TABLE OF CONTENTS

SECTIONS

1.	BACKGROUND	1
2.	COMMENT	2
2.1	TECHNICAL RULES REQUIREMENT	2
2.2	ADVANTAGES AND DISADVANTAGES OF GRANTING THE EXEMPTION	2
2.2.1	Advantages.....	2
2.2.2	Disadvantages	3
2.3	PUBLIC CONSULTATION SUBMISSIONS.....	3
3.	CONCLUSIONS AND RECOMMENDATION	4

DISCLAIMER

This report has been prepared for the Economic Regulation Authority to assist it in its review of Western Power's application for an exemption from clause 2.5.2.2 of its Technical Rules to allow the constrained connection of the Byford photovoltaic solar farm. Geoff Brown and Associates Ltd accepts no responsibility to any party other than the Authority for the accuracy or completeness of the information or advice provided in this report and does not accept liability to any party if this report is used for other than its stated purpose.

Geoff Brown & Associates Ltd

77 Taylors Rd
Mt Albert
Auckland 1025
New Zealand
www.gbassoc.com

Ph/Fax: 64-9-846 6004
Mob: 64-21-466 693
Email: geoff@gbassoc.com

1. BACKGROUND

WestGen Pty Ltd (WestGen) has submitted three individual connection applications to Western Power to connect its planned Byford photovoltaic solar power generation farm to the South West Interconnected Network (SWIN). The solar farm will have three photovoltaic generators, each with a declared sent out capacity of 9.9MW. It is located approximately 8km west of Western Power's Byford substation and it is proposed that each photovoltaic generator be connected to the 22kV busbar at the substation via a separate 22kV feeder.

Currently the transmission system within the SWIN is planned as an unconstrained network in that, where the peak load of a part of a network is greater than 20 MVA, there must be sufficient redundancy built into the network to maintain supply and avoid load shedding if any one transmission element, such as a transmission line or transformer, is out of service¹, irrespective of the generation schedule.

Currently there is insufficient capacity in the 132kV network within the Mandurah load area to maintain supply and avoid load shedding under N-1 network conditions if the planned Byford solar farm was allowed to connect and was generating its full declared sent out power. Put another way, if the Byford solar farm is permitted to connect to the existing network, there is a risk that the thermal power transfer capacity of one or more of the 132kV lines in the load area will be exceeded when another 132kV line is out of service. Given the planning requirements of Western Power's Technical Rules (which are based on the requirement to maintain an unconstrained network), a network augmentation would be necessary before the Byford solar farm could connect. In such circumstances Western Power would normally require a capital contribution towards the cost of the augmentation from the owner of the asset wishing to connect (in this case WestGen).

In order to connect to the existing network without having to pay a capital contribution for the augmentation, WestGen is proposing to fit a runback scheme so that the power output of the Byford solar farm could be reduced whenever an operating situation arises where there is potential for a line overload to occur.

In accordance with Section 12.40 of the Access Code (Code), Western Power has applied to the Authority for an exemption from clause 2.5.2.2 of its Technical Rules (Rules) so that the Byford solar power farm can connect to the network without the need for a network augmentation. Under Section 2.41 of the Code, the Authority must determine the application as a reasonable and prudent person on reasonable technical and operational grounds, having regard to the affect the proposed exemption will have on the service provider (Western Power) and users of the network and any interconnected network. It must grant the exemption if it determines that in all the circumstances the disadvantages of requiring compliance with the Rules are likely to exceed the advantages.

The Authority has contracted Geoff Brown and Associates to provide advice in relation to Western Power's application and this report documents the advice given.

Western Power's application also stated that, following the connection of the Byford solar farm to the SWIN, the single phase fault levels at the 132kV bus sections at the Kwinana and Southern Terminal stations could potentially exceed 95% of the equipment fault rating. This is a non-compliance with clause 2.5.7 of its Technical Rules. However, Western Power has not applied for an exemption from this clause and has provided no further details, so we have not considered this matter in our report.

¹ This is known within the industry as an N-1 situation.

2. COMMENT

2.1 TECHNICAL RULES REQUIREMENT

Clause 2.5.2.2 of the Rules states:

2.5.2.2 *N-1 Criterion*

- (a) *Any sub-network of the transmission system that is not identified within this clause 2.5.2 as being designed to another criterion must be designed to the N-1 planning criterion.*
- (b) *For sub-networks designed to the N-1 criterion (excluding a zone substation designed to the 1% risk or NCR criteria in accordance with clause 2.5.4), supply must be maintained and load shedding avoided at any load level and for any generation schedule following an outage of any single transmission element.*
- (c) *Following the loss of the transmission element, the power system must continue to operate in accordance with the power system performance standards specified in clause 2.2.*
- (d) *Notwithstanding the requirements clauses 2.5.2.2(b) and 2.5.2.2(c), where the failed transmission element is a zone substation supply transformer, supply may be lost for a brief switching period while loads are transferred to un-faulted supply transformers by means of distribution system switching. The Network Service Provider must maintain sufficient power transfer capacity to allow supply to all Consumers to be restored following switching.*

Clause 2.5.2.2 requires the network to have sufficient capacity so that a connected generator is able to generate at its full declared sent out power notwithstanding the occurrence of an N-1 contingency event. As indicated in Section 2, the existing network in the Mandurah load area has insufficient capacity to allow unconstrained operation of the proposed new Byford solar farm. WestGen is therefore proposing a constrained connection to the network through the installation of a runback scheme that would reduce the sent out power from the solar farm to avoid a line overload arising following an N-1 contingency event.

This reduction in sent out power would not disrupt supply to consumers as the lost Byford solar farm generation would be offset by increasing the sent out power output of generators connected elsewhere on the network. In the event that the Byford solar farm sent out power was run back to zero, the operating state of the network would revert to the state that existed prior to the connection.

2.2 ADVANTAGES AND DISADVANTAGES OF GRANTING THE EXEMPTION

2.2.1 Advantages

- If the exemption is granted, Western Power will be able to connect the Byford solar farm generation to its network without having to augment the transmission system to meet the no constraint requirement of the Rules. Transmission system augmentations can be expensive and the requirement to pay a capital contribution toward the cost of increasing the capacity of the transmission system

to ensure full compliance with the Rules can constitute a barrier to the entry of new generation into the market.

- While we have not seen any economic analysis, it is most likely that the discounted cost of the runback scheme over the life of the solar farm is substantially less than the capital cost of any network augmentation, to the extent that it could be uneconomic for the Byford solar farm/WestGen generation to connect without an exemption being granted.
- Assuming that Byford solar farm/WestGen does not connect if the exemption is not granted, the environment benefits, including reduced carbon emissions, of connecting a solar farm to the SWIN would not be captured.
- Granting the exemption would be consistent with the objective of the Code, as set out in clause 2.1:

The objective of this Code is to promote the economically efficient:

(a) investment in; and

(b) operation of and use of,

networks and services of networks in Western Australia in order to promote competition in markets upstream and downstream of the networks.

This is because it will increase the utilisation of the existing transmission system asset base and promote competition in the upstream generation market.

2.2.2 Disadvantages

- If the exemption is granted, the sent out power from the Byford solar farm may need to be reduced following an N-1 contingency. However, supply to consumers connected to the SWIN would not be interrupted. WestGen has agreed to a constrained connection and the operation of a runback scheme as a requirement for connection to the SWIN. A letter from WestGen to this effect was included as Attachment 1 to Western Power's application.

2.3 PUBLIC CONSULTATION SUBMISSIONS

Two submissions were received in response to the Authority's call for comment on Western Power's application and both supported the exemption being granted.

- The Independent Market Operator (IMO) noted that the requested exemption was proposed to apply until the earlier of the establishment of a proposed network constraint tool (NCT) applicable to South Country generation or 1 November 2018 and expressed the view that the proposed NCT cannot be implemented successfully under the current regulatory and market framework.

We have not been asked to comment on the proposed NCT. We note however that the later termination date of 1 November 2018 is at variance with the copy of the Western Power application provided to us, which proposed that the exemption apply for an indefinite period and continue in place until either the proposed NCT becomes effective or the exemption is otherwise revoked. We see no reason for the exemption to include an arbitrary termination date. We note that a termination date of 1 November 2018 would fall well within the life of the photovoltaic generators. This termination date appears arbitrary and appears to present an unjustified commercial risk to WestGen.

- Community Electricity submitted that it supports the application but this support is conditional on the IMO being satisfied that the NCT is fit for purpose and properly integrated with the Wholesale Electricity Market balancing market. As indicated above, this issue is outside the terms of reference for this review.

3. CONCLUSIONS AND RECOMMENDATION

We consider that the advantages of granting the exemption from clause 2.5.2.2 of the Rules outweigh the disadvantages. We therefore recommend that Western Power's application to exempt the connection of the Byford photovoltaic solar farm from this clause of the Rules be granted by the Authority.

We see no justification for a prescribed termination date of 1 November 2018 and consider that the exemption should remain in place until the regulatory and market framework governing generator access changes to the extent that it is no longer needed.