Nilgen wind farm connection – 107.25 MW

Submission for exemption from compliance with clause 2.5.2.2 (N-1 criterion) of the Technical Rules for the Nilgen wind farm (107.25 MW) connection

DATE: November 2012

DOCUMENT PREPARED BY:

Western Power
GPO Box L921, Perth WA 6842
ABN 18 540 492 861

DMS#: 9759053

safe reliable efficient

Table of Contents

Glossary

Acronym / term	Meaning
Authority	Economic Regulation Authority
CTB	Cataby substation
DSOC	Declared send out capacity
ERA	Economic Regulation Authority
MVA	Apparent power
MW	Real power
PJR	Pinjar substation
RIS	Require in service
WPN	Western Power Network

Executive Summary

This submission requests the Economic Regulation Authority (ERA) grant Western Power an exemption from complying with Clause 2.5.2.2 (N-1 criterion) of the Technical Rules with respect to the connection of the Nilgen wind farm (107.25 MW[1] declared sent out capacity (DSOC)).

The Nilgen wind farm (Nilgen) is proposed to be located approximately 9 km north-east of Lancelin. The wind farm is proposed to be connected in the North Country by cutting in and out of the existing Pinjar – Cataby 132 kV transmission line (PJR-CTB 81).

Western Power's studies have identified that under the maximum generation scenario, where all the existing generators in the North Country and Northern Terminal load areas are exporting at their DSOC, there is a potential overloading issue in the Neerabup load area. There is a very low probability of this scenario occurring. Nevertheless; connection of the Nilgen wind farm does increase this probability slightly in this situation.

Western Power has identified a number of network reinforcement options to address the potential line overloads in the Neerabup area. However studies conducted have shown that options with costs in excess of $50M would still not facilitate compliance with Clause 2.5.2.2.of the Technical Rules. Two relatively low cost reinforcements were identified that reduce the probability of Nilgen being required to run back. However no feasible options were identified that can efficiently provide Nilgen with an unconstrained connection while at the same time being financially acceptable to Nilgen.

The proposed connection arrangement incorporates the following:

1. The point of connection to be at a new Nilgen substation connected by cutting in and out of the existing Pinjar to Cataby 132 kV line
2. Up rating of the Joondalup to Wanneroo 132 kV line
3. Installation of dynamic line rating equipment on the Mullaloo to Joondalup 132 kV line to reduce the probability of runback events
4. Installation of a runback scheme for Nilgen to prevent pre-contingent overloading as well as contingent (N-1) overloading in the network.

Based on efficiently balancing Nilgen's requirements and current network considerations, Western Power has proposed to provide Nilgen with a constrained connection subject to Western Power's Application and Queuing Policy. Nilgen has accepted the proposed connection arrangement and understands the potential financial impact from the constrained connection. The anticipated runback hours for the wind farm with the proposed connection arrangement is extremely low, and immaterial to the operation of Nilgen.

The proposed connection arrangement has no adverse impact on the existing level of safety and reliability to other network users and does not stifle any future strategic network developments.

Under section 12.40 of the *Electricity Networks Access Code 2004*, Western Power as the *Service Provider* for the *Western Power Covered Network* hereby applies to the Authority for exemption from a specific requirement of the Technical Rules, as follows:

[1] 107.25 MW = 52.25 MW stage 1 + 55 MW stage 2

"Western Power is exempted from complying with the requirements of Clause 2.5.2.2 of the Technical Rules with respect to the connection of the Nilgen wind farm (107.25 MW). The exemption will allow Western Power to provide Nilgen with a constrained connection. The output of Nilgen will be runback (reduced) as required to prevent a pre-contingent overloading as well as a contingent (N-1) overloading in the network.

The exemption will apply for an indefinite period unless revoked under the provisions of the Electricity Networks Access Code 2004."

1 Introduction

Nilgen Windfarm Pty Ltd (Nilgen) has submitted two connection applications for a wind farm with a total contracted Declared Send Out Capacity (DSOC) of 107.25 MW

Following the completion of access studies, it is proposed to offer connection of the Nilgen wind farm to the Western Power Network (WPN) by cutting in and out of the existing Pinjar – Cataby 132 kV transmission line (PJR-CTB 81), subject to Western Power's Application and Queuing Policy.

The proposed connection arrangement is for the Nilgen wind farm to be connected on a constrained basis that does not comply with Clause 2.5.2.2 (N-1 criterion) of the Technical Rules.

This submission requests the Authority approve the exemption from the above-mentioned specific clause of the Technical Rules so as to allow connection of the Nilgen wind farm on a constrained basis. The proposed connection arrangement balances the technical and economic requirements of Nilgen without any material impact on other network users.

2 Nilgen wind farm connection arrangement

2.1 Current network operation

The transmission network where Nilgen is to be connected is shown in Figure 2-1. The network is currently designed to the N-1 planning criterion as per Clause 2.5.2.2 of the Technical Rules. This means for the loss of any single transmission element the supply to this network is maintained and load shedding is avoided.

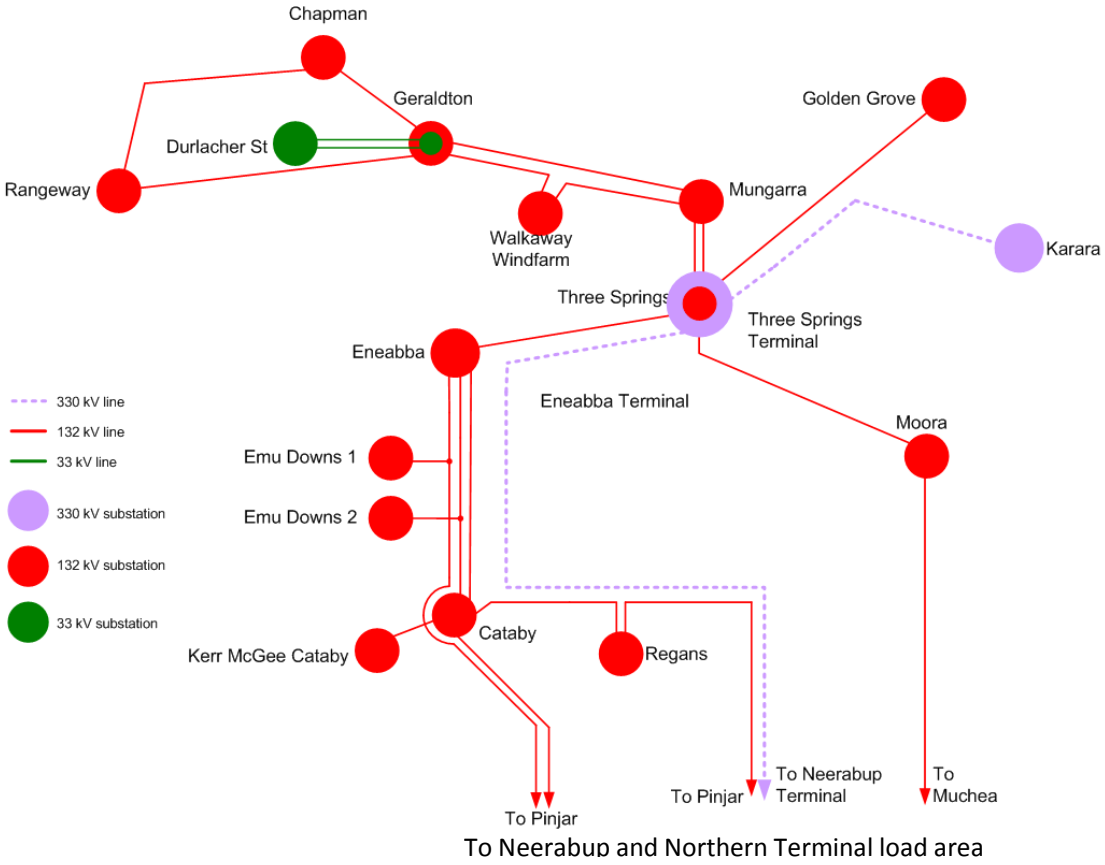

Figure 2-1: North Country network (including the MWEP Southern Section to be completed in 2014)

Western Power's studies identified that under the maximum generation scenario, where all the existing generators in the North Country and Northern Terminal load areas are exporting at their respective DSOCs, there is a potential overloading issue in the Neerabup load area. The Neerabup load area covers the northern-most part of the Perth Metropolitan region, from Padbury and West Swan in the south to Yanchep in the north and Muchea in the east.

Given that Western Power reconfigures the network and already has arrangements in place to runback some of the existing generators in the event of contingent (N-1) overloading in the network, this generation scenario has an extremely low probability of occurring and can be considered as being non-credible. This ensures that the N-1 criterion is met at all times.

2.2 Connection of Nilgen wind farm

The point of connection for the Nilgen wind farm is shown in Figure 2-2 and summarized in Table 2-1. The wind farm will be connected at a nominal voltage of 132 kV to the proposed Nilgen substation. The Nilgen substation will be connected to the network by cutting in and out of the existing PJR-CTB 81 line. The wind farm will be located approximately 9 km north-east of Lancelin, WA as shown in Figure 2-3.

In order to ensure the network planning criterion will continue to be met, the Nilgen wind farm is proposed to be connected on a constrained basis. The output from the Nilgen wind farm will be runback to prevent pre-contingent overloading as well as contingent (N-1) overloading of a number of network elements in the Neerabup load area.

The proposed connection arrangement incorporates the following:

1. The point of connection to be at a new Nilgen substation connected by cutting in and out of the existing Pinjar to Cataby 132 kV line
2. Up rating of the Joondalup to Wanneroo 132 kV line
3. Installation of dynamic line rating equipment on the Mullaloo to Joondalup 132 kV line to reduce the probability of runback events
4. Installation of a runback scheme for Nilgen to prevent pre-contingent overloading as well as contingent (N-1) overloading in the network.

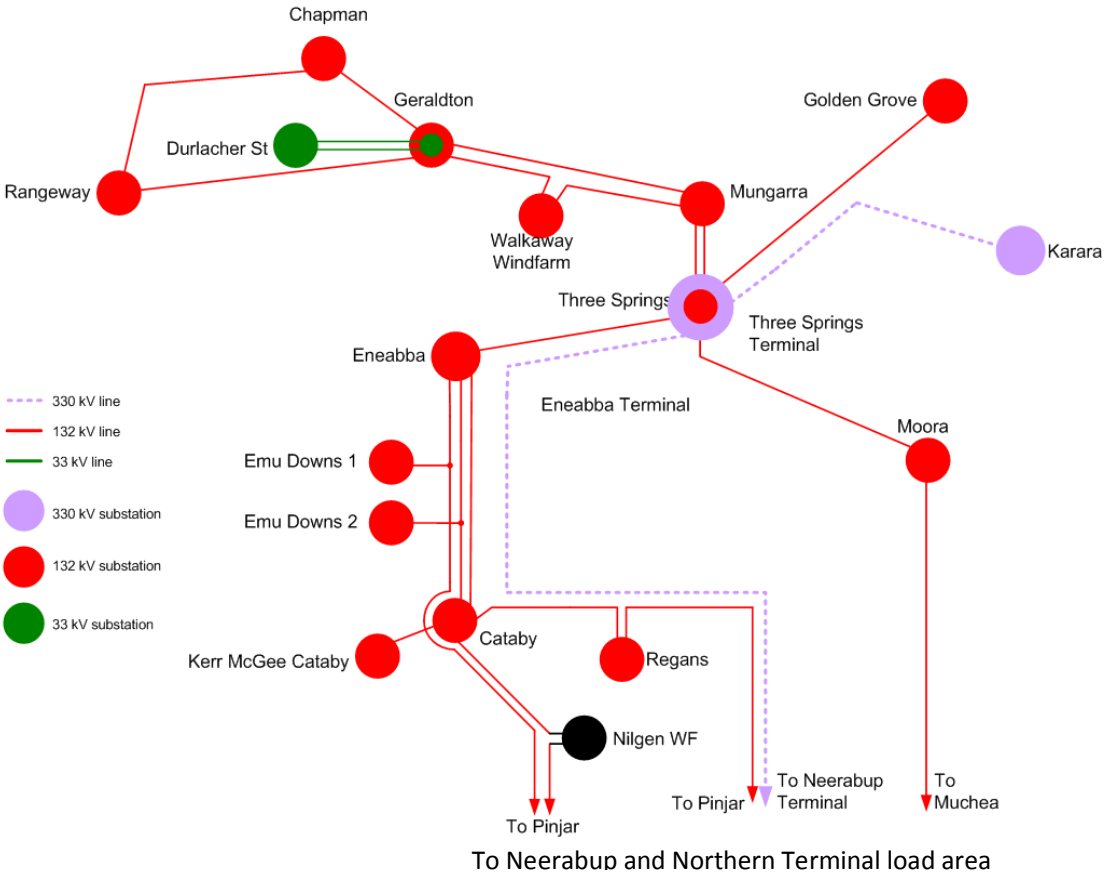

Figure 2-2: North Country network with Nilgen wind farm (including MWEP Southern Section to be completed in 2014)

Table 2-1: Point of connection details

Point of Connection	A new Nilgen Substation – a switching station (configuration to be decided)
Connection to WPN	Nilgen substation to cut in and out of the exist Pinjar – Cataby 132 kV line
DSOC	107.25 MW

Figure 2-3: Nilgen Wind farm – Proposed location

3 Technical Rules Requirement

Clause 2.5.2.2 of the Technical Rules specifies any sub-network not otherwise identified as designed to N-0 or N-1-1 level) is to be designed to an N-1 planning criterion. The clause is applicable to the sub-network impacted by the wind farm connection. The clause states:

> "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*."

By defining *supply* to include *transport of electricity* this clause states that a generator must be able to export up to its DSOC value under N-1 for any generation schedule. The proposed connection arrangement for Nilgen is not designed to meet this N-1 planning criterion.

4 Exemption Justification

4.1 Connection arrangement in consultation with Nilgen

Western Power has identified a number of network reinforcement options to minimize the impact of connecting the Nilgen wind farm. Studies conducted have shown that options with costs in excess of $50M would still not comply with Clause 2.5.2.2.of the Technical Rules. Although the studies identified two relatively low cost reinforcements that serve to reduce the probability of Nilgen being required to run back, no feasible options were identified that can efficiently provide Nilgen with an unconstrained connection while at the same time being financially acceptable to Nilgen.

The two minor reinforcements identified were:

1. Up rating of the Joondalup to Wanneroo 132 kV line, and
2. Installation of dynamic line rating equipment on the Mullaloo to Joondalup 132 kV line to reduce the probability of runback events

Following consultation with Nilgen, it was confirmed that constraining the wind farm output to prevent pre-contingent overloading as well as contingent (N-1) overloading in the network, is acceptable to their operation without unnecessarily incurring additional cost to provide an unconstrained connection.

Based on efficiently balancing Nilgen's requirement and current network considerations, Western Power has proposed to provide Nilgen with this constrained connection subject to Western Power's Application and Queuing Policy. Nilgen has accepted the proposed connection arrangement and understands the potential financial impact from the constrained connection.

The anticipated runback hours for the wind farm with the proposed connection arrangement is extremely low, and immaterial to the operation of Nilgen.

4.2 Consultation with Nilgen

Nilgen and Western Power have progressed the connection application through an extensive consultation process.

Nilgen has provided a letter confirming its understanding of the nature of the proposed connection arrangement, the necessary runback scheme, and the impact on the wind farm operations. This letter further supports Western Power's submission and acknowledges the extensive consultation that has taken place.

4.3 Impact on other existing network users

The proposed connection arrangement has no adverse impact on the existing level of safety and reliability to the other network users and does not stifle any future strategic network developments.

5 Statement of Technical Rules exemption

Under section 12.40 of the *Electricity Networks Access Code 2004*, Western Power as the *Service Provider* for the *Western Power Covered Network* hereby applies to the Authority for exemption from a specific requirement of the Technical Rules, as follows:

"Western Power is exempted from complying with the requirements of Clause 2.5.2.2 of the Technical Rules with respect to the connection of the Nilgen wind farm (107.25 MW). The exemption will allow Western Power to provide Nilgen with a constrained connection. The output of the Nilgen wind farm will be runback (reduced) as required to prevent a pre-contingent overloading as well as contingent (N-1) overloading in the network.

The exemption will apply for an indefinite period unless revoked under the provisions of the Electricity Networks Access Code 2004."

Attachment 1: Nilgen Letter of Acknowledgement

PacificHydro

CELEBRATING 20 YEARS OF CLEAN ENERGY

11 October 2012

Mr Paul Italiano
Chief Executive Officer
Western Power
363 Wellington Street
Perth WA 6000

Dear Mr Italiano

Western Power submission for Nilgen Wind Farm Technical Rules exemption

Pacific Hydro is a leading Australian renewable energy company. Our operating assets include wind farms in Victoria and South Australia with a combined generating capacity of 260MW and the 30MW Ord River hydro plant in Western Australia.

Our Nilgen wind farm site is located 9km east of Lancelin and 135km north of Perth. The Nilgen project, comprising of 39 turbines with a total capacity of 107.25MW, requires 132kV grid connection to the Western Power network.

Over several years Pacific Hydro has invested significant resources in close consultation with Western Power to progress to an acceptable grid connection. Pacific Hydro and Western Power have studied a number of alternatives to allow Nilgen to connect with an acceptable level of reliability. The option recommended by Western Power is the only alternative that provides Nilgen with a satisfactory balance between connection reliability and cost.

Pacific Hydro has had the opportunity to review Western Power's proposed submission and is fully supportive of the application for exemption from Clause 2.5.2.2 of the Technical Rules.

The consequent implementation of a constrained connection and operation of a runback scheme is supported by Pacific Hydro as a requirement of our grid connection. We consider the level of reliability and energy at risk anticipated under this arrangement to be acceptable and therefore support Western Power's conclusion that this connection arrangement minimises the cost for marginal improvement of reliability.

If you wish to discuss this matter further with Pacific Hydro please contact John Vendel on 03 8621 6308

Yours sincerely

Tom Keddie
Executive Manager Development
Pacific Hydro Australia

Pacific Hydro Pty Ltd ABN 31 057 279 508
Level 11, 474 Flinders Street Melbourne Victoria 3000 Australia | Telephone +61 3 8621 6000 | Facsimile +61 3 8621 6111 | pacifichydro.com.au

Attachment 2: References

Doc Ref #	**Title**	**Date Issued**
9974591	Nilgen connection – Work Planning Report	November 2012