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REVIEW OF WESTERN POWER'S APPLICATION FOR A TECHNICAL RULES EXEMPTION FOR NILGEN WIND FARM

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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 to clause 2.5.2.2 of its Technical Rules to allow the constrained connection of the Nilgen wind 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.

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1. BACKGROUND

Nilgen Windfarm Pty Ltd (Nilgen) has submitted two connection applications to Western Power for connection of a wind farm with a total contracted Declared Send Out Capacity (DSOC) of 107.25 MW to the 132 kV network in the North Country load area. The wind farm is located at Lancelin, approximately 130 km north of Perth, and it is proposed that it will be connected to the Perth-Cataby 81 132 kV circuit. It will be constructed in two stages, the first of 52.25 MW and the second of 55 MW, but it is not clear at this stage when construction of the first stage will commence.

Due to a constraint in the power transfer capacity of the transmission system between Neerabup and Northern Terminal substations, there is a limitation on the amount of electricity that can be exported south from Neerabup. Scheduled generation in the North Country load area includes Verve Energy's Pinjar power station with a DSOC of 587 MW and Newgen's 330 MW Neerabup power station. Both power stations are gas fired, open cycle gas turbines, which we understand are operated as peaking plants and also used as spinning reserve. In addition, there are two existing wind farms in the North Country, Emu Downs (79 MW) and Walkaway (89 MW). Peak demand in the country north load area is about 250 MW. Hence, at times of high load, when Neerabup and Pinjar power stations are dispatched at high levels, power transfer capacity down to Northern Terminal must be available to transfer this power into the Perth metropolitan load area, as there is insufficient load north of the constraint[1]. The connection of additional non-scheduled wind generation in the North Country, such as Nilgen, will exacerbate this situation.

As Pinjar and Neerabup are both peaking plants, they are rarely dispatched at their full capacity. Hence, for most of the time the limited power transfer capacity between Neerabup and Northern Terminal does not affect the operation of the power system and there would be spare capacity available to accommodate the Nilgen connection.

In order to accommodate the Nilgen connection, Western Power is proposing to:

- undertake minor strategic upgrades to the 132 kV network between Neerabup and Northern Terminal to provide a small increase in power transfer capacity. These include uprating the Joondalup-Wanneroo 132 kV line by increasing its ground clearance and installing dynamic line rating on the Joondalup-Mullaloo line; and

- installing a runback scheme to limit the output of the Nilgen wind farm at times when the Neerabup and Pinjar power stations are dispatched to a level that there could be insufficient power transfer capacity south of Neerabup to accommodate Nilgen and also when the power transfer capacity across the constraint is less than normal because a transmission element is out of service.

Implementation of these arrangements is estimated to cost $1.5 million and Nilgen has agreed to be connected subject to operating constraints. These operating constraints will mean that:

- at times of high generation dispatch, the output from Nilgen will be limited to 51 MW; and

- when the power transfer capacity across the constraint is curtailed by an N-1 transmission element outage, the output from Nilgen will be curtailed completely – generation will be run back to zero.

Given typical generation dispatch scenarios, Western Power expects that runback due to high generation dispatch will rarely be required. We assume that the N-1 load curtailment will therefore be the more onerous operating constraint from Nilgen's perspective.

[1] This applies irrespective of whether the generation is dispatched on load or as spinning reserve. If the generation is dispatched as spinning reserve then transmission capacity must also be kept in reserve for use if required.

In order for this connection to proceed, Western Power as applied to the Economic Regulation Authority (Authority) for an exemption from clause 2.5.2.2 of the Technical Rules. We have been engaged by the Authority to review this application and this report documents the outcome of our review.

2. COMMENT

2.1 TECHNICAL RULES REQUIREMENT

Clause 2.5.2.2 of the Technical 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 rated output for all credible generation dispatch scenarios, notwithstanding the occurrence of an N-1 contingency event. This could lead to situations where consumers are required to pay more for electricity than necessary, without any offsetting benefit in the quality or reliability of supply.

When a transmission network's available power transfer capacity is insufficient to allow available generation to be fully dispatched in accordance with the merit order prescribed by the market rules, the network is said to be "constrained" at that point. However, load fluctuates throughout the year and for most of the time a constraint may not affect network operation, as the demand is sufficiently low that the full power transfer capacity across the constraint is not required.

However, at times of high network demand a situation may arise where the constraint is said to "bind". This is where, under an optimal generation dispatch scenario, the required power flow across the constraint is higher than the available capacity. As a result, there is a surplus of scheduled generation on the generation side of the constraint and a deficit on the load side. The prudent operating response is then to manage the power flow across the constraint by reducing the generation on the supply side and increasing the generation on the load side. Unfortunately, this has a cost to consumers because the use of low cost generation is reduced and higher cost generation must be dispatched in its place[2].

[2] Demand side management responses may also be available, but these also generally have a cost.

From a technical perspective this is not an issue. From an economic perspective it only becomes an issue once the peak demand rises to the point where the incremental annual cost of dispatching the higher cost generation exceeds the annualised cost of the network augmentation required to remove the constraint. After that point, the overall cost to customers will be minimised by proceeding with the network augmentation to allow the lower cost generation to be used. Before the peak demand on the network increases to this "tipping point", total costs would be lower if the market lived with the constraint and ran the out-of-merit generation whenever the constraint bound. All else being equal, the quality of supply provided to customers will be the same in either case.

Hence the economic impact of a constraint is related to the extent to which the out-of-merit generation must be used. This is related to the number of hours over a year in which this generation is needed, which in turn will increase as the peak demand on the network increases.

The problem with clause 2.5.2.2 of the Technical Rules when it is applied to generators is that it can override these economic signals and favour a network solution, irrespective of whether or not this is economic. It implies that any network constraint is bad and should be avoided. In our view this is not an efficient way to operate an electricity market.

It should be noted that constraints already exist on the Western Power network and are routinely managed. The supply to Geraldton, where the Mungarra gas turbines are operated out of merit to avoid the network constraint north of Three Springs, is an obvious example.

It follows that, in our view, it may not be appropriate to apply clause 2.5.2.2 of Western Power's Technical Rules to generator points of connection and this clause should not be used as a basis for preventing a generator connecting to the network subject to operating constraints. Where it is in the interests of consumers that a new generator connects to the network and where the proponent is prepared to accept operating restrictions necessary to address network capacity limitations or ensure the security of the power system, the proponent should generally be permitted to connect. Other requirements of the Technical Rules should ensure that other network users are not disadvantaged if a generator is connected to the network subject to constrained operation.

2.2 MID WEST ENERGY PROJECT

One of the arguments submitted by Western Power in support of its applications for Regulatory Test and New Facilities Investment Test (NFIT) approval for the Mid-West Energy Project (MWEP) (southern section) was that the MWEP would allow new generation, and particularly new wind generation, to connect to the network and participate in the wholesale energy market. The Nilgen wind farm will connect to the existing Pinjar-Cataby 81 132 kV circuit and therefore does not rely on MWEP assets.

Western Power has commented that:

> *The Nilgen wind farm benefits from the MWEP Southern Section in that, decommissioning of the oldest and lowest capacity line from Pinjar to Eneabba and its replacement with the high capacity MWEP Southern Section line significantly reduces the likely incidence of run-back and improves the economic viability of the project*[3]*.*

We agree with this to the extent that the MWEP southern section has allowed additional load, particularly Karara Stage 1, to connect to the network. At times when Neerabup and Pinjar are dispatched, the electricity supplied to this new load bypasses the Neerabup-Northern Terminal constraint. Hence more North Country generation can be operational before the constraint binds and thus the need to limit the output of the Nilgen wind farm will be reduced.

[3] Email from Western Power to the Authority, 17 December, 2012.

2.3 PUBLIC CONSULTATION SUBMISSIONS

Four submissions were received in response to the Authority's call for comment on Western Power's application and all four submitted that proponents seeking connection on a constrained access basis should be allowed to connect. Verve Energy raised a separate issue relating to how Western Power's Applications and Queuing Policy (AQP) would be applied, but this is a matter outside the scope of this review. We note that further generation seeking connection in the North Country load area would also be subject to run back operating constraints. The level of runback necessary could be reduced either through the connection of additional load in the North Country load area or by further network augmentation to increase the power transfer capacity across the Neerabup-Northern Terminal constraint.

3. CONCLUSIONS AND RECOMMENDATION

We do not consider it in the interests of economic efficiency that Clause 2.5.2.2 of Western Power's Technical Rules be used to prevent the constrained connection of new generation to Western Power's transmission network. We therefore recommend that Western Power's application to exempt the connection of the Nilgen wind farm from this clause of the Technical Rules be approved by the Authority.