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NETWORK SUPPORT FORECAST METHODOLOGY

Grid Planning			
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1 BACKGROUND

Powerlink is the sole holder of the transmission authority in Queensland, which authorises it, under the Queensland Electricity Act, to operate the high voltage transmission grid in the east coast part of Queensland. Powerlink is also registered as a Transmission Network Services Provider (TNSP) in the NEM and must comply with the National Electricity Rules (NER).

Under the Queensland legislation, Powerlink has the responsibility to plan for the future Queensland transmission needs, including the interconnection with other networks. These planning responsibilities are defined in the NER, the Electricity Act 1994 and in Powerlink Queensland's Transmission Authority issued by the Queensland Government.

The Rules require Powerlink to identify, evaluate and compare network and non-network options (such as generation and demand side management) to determine the feasible option which maximises the present value of net market benefits.

In order for a potential non-network solution to be considered as a genuine alternative to network augmentation, the solution must deliver reliability outcomes consistent with Powerlink's mandated reliability obligations and accept, on a commensurate basis, levels of liability similar to those accepted by TNSPs. In order to achieve this Powerlink enters into Network Support Agreements (NSAs) as the alternative to network augmentations where it is economic to do so.

2 STATUTORY OBLIGATIONS

As a TNSP, Powerlink must comply with the requirements of 5.6.5C of the NER and in particular, 5.6.5C(a):

> *"(a) A Transmission Network Service Provider must apply the regulatory investment test for transmission to a proposed transmission investment..."*

Clause 5.6.5B(c) lists relevant characteristics of the regulatory investment test for transmission:

> *"The regulatory investment test for transmission must:*
>
> *(1) be based on a cost-benefit analysis that is to include an assessment of reasonable scenarios of future supply and demand if each credible option were implemented compared to the situation where no option is implemented;*
>
> *(2) not require a level of analysis that is disproportionate to the scale and likely impact of each of the credible options being considered;*
>
> *(3) be capable of being applied in a predictable, transparent and consistent manner;*
>
> *(4) require the Transmission Network Service Provider to consider the following classes of market benefits that could be delivered by the credible option:*
>
> *(i) changes in fuel consumption arising through different patterns of generation dispatch;*
>
> *(ii) changes in voluntary load curtailment;*

(iii) changes in involuntary load shedding, with the market benefit to be considered using a reasonable forecast of the value of electricity to consumers;
(iv) changes in costs for parties, other than the Transmission Network Service Provider, due to:
(A) differences in the timing of new plant;
(B) differences in capital costs; and
(C) differences in the operating and maintenance costs;
(v) differences in the timing of transmission investment;
(vi) changes in network losses;
(vii) changes in ancillary services costs;
(viii) competition benefits;
(ix) any additional option value (where this value has not already been included in the other classes of market benefits) gained or foregone from implementing that credible option with respect to the likely future investment needs of the market; and
(x) other classes of market benefits that are:
(A) determined to be relevant by the Transmission Network Service Provider and agreed to by the AER in writing before the date the relevant project specification consultation report is made available to other parties under clause 5.6.6; or
(B) specified as a class of market benefit in the regulatory investment test for transmission;

(5) require a Transmission Network Service Provider to include a quantification of all classes of market benefits which are determined to be material in the Transmission Network Service Provider's reasonable opinion;

……"

3 NETWORK SUPPORT OUTLOOK

Network support, in conjunction with network augmentation, continues to be the most cost effective supply option for North Queensland.

Powerlink has not found network support opportunities (which would result in maximising the present value of net market benefit) in any other area of the state during the outlook period.

4 MARKET BENEFITS IN THE CONTEXT OF NORTH QUEENSLAND

Network support requirements are strongly interlinked with the central to north Queensland (CQNQ) transmission limit. The transmission limit is reflective of its state of network development. As indicated in Section 2, network and accompanying non-network options must take account of their impacts on market operation. The total market benefits are the summation of all the market benefit categories mentioned within Section 2.

In the analysis of network support and the timing of network developments to augment CQNQ limits, the most significant market benefit is the change in variable operating costs. These are captured in Powerlink's modelling procedure described in Section 5.

The market price for electricity in Queensland is determined at the Regional Reference Node (South Pine) which corresponds to the load centre in South East Queensland. As power flows from Central Queensland to North and Far North Queensland do not directly impact this price setting process, changes to the power transfer capability from Central Queensland to North and Far North Queensland do not result in material changes to the market prices for electricity. Market benefits associated with changes in market prices have little impact in the economic analysis of central to north Queensland augmentation options.

Changes to voluntary load curtailment are predominantly associated with market prices and are therefore insensitive to the proposed network augmentations. Although dwarfed by changes in variable operating costs, these are also captured in Powerlink's modelling procedure.

Powerlink has reliability and quality of supply obligations under the NER, its Transmission Authority and connection agreements with customers. In particular, Powerlink must plan and develop its transmission system in accordance with good electricity industry practice, such that its network is able to meet forecast electricity demand during an outage of the most critical single network element, what is commonly known as an N-1 situation, unless otherwise agreed with affected parties. As Powerlink must plan and develop its transmission system to meet forecast demand any involuntary load shedding calculated would be the result of a low probability event or from insufficient generation planting rather than as a result of the network augmentation. Therefore, Powerlink has elected not to include any such benefits reported by the market simulation.

Network augmentation may in some cases defer the need for additional generating capacity through the sharing of generation reserves. This is not the case in North and Far North Queensland. The existing transmission network already allows generating plant in North and Far North Queensland to be utilised in meeting peak electricity demands across Queensland, and the broader NEM (i.e. there is no binding constraint occurring for generators exporting power from the area). In addition, as none of the options examined have a material impact on the market price for electricity, Powerlink considers that there will be no deferral of new generation entry under any of the network development options to be considered.

The commercial market simulation software employed by Powerlink, which was selected to make use of the available NEM wide database, cannot effectively account for intra-regional loss changes for different upgrade capacities. Given the second order impact of loss change, no attempt has been made to redevelop the software to account for this issue.

There are no identified ancillary services affected by the network development options considered.

Competition benefits are the benefits resulting from an increase in competition between generators delivering lower prices across the NEM. As none of the options examined will have a material impact on the market price for electricity, Powerlink considers that there will be no additional competition benefits under any of the options considered.

5 MODELLING APPROACH

The following approach adopted by Powerlink is considered technically sound as well as recognising the resource intensive and parameter sensitive nature of market analysis:

1. Obtain a relevant NEM database (NEM DB)
    a. Considerations include:

   i. Compatibility with PROPHET (Powerlink licensed market analysis software) .
   ii. Preferably source is independent, thorough and industry recognised in the field
b. AEMO's latest annual market analysis database meets the above considerations

2. Initialise NEM DB to accommodate Powerlink's evolved NQ NSA modelling techniques
   a. Remove generic constraints to be modelled in greater detail
   b. Remove NQ new entrants in NEM DB
   c. Disable forced outages
   d. Disable planned outages for NQ plant

3. Incorporate Powerlink future scenarios for the area of interest
   a. Model Powerlink's new entrants based on most appropriate models (taking account of NEM DB reference year)
   b. Create demand traces for NQ and West Central West (CW) zone, accounting for both the 50% PoE summer maximum demand and energy forecasts (based on NEM DB's reference year) for the three economic outlooks (high, medium and low)
   c. Create scenarios and study years which allow the selection of:
      i. Most appropriate NEM DB scenario (CPRS)
      ii. Appropriate NQ and West CW load trace economic outlook
      iii. Corresponding Powerlink new entrant or decommissioning

4. Customise the market analysis database based on Powerlink's evolved NQ NSA modelling techniques
   a. Create generic constraints for each network development stages to be analysed
   b. Import and link generation traces for (based on AEMO's reference year) existing non-NSA generators
   c. Create sub-scenarios to test economics of entering into NSAs with different combinations of NQ plant
   d. Create scriptlets to capture NSA likely operation and costs
   e. Create reports to assist in debugging and the market benefit analysis (e.g. include variable operating costs and voluntary load curtailment)

5. Run simulations, develop Capital Expenditure (CAPEX) and NSA forecasts
   a. Run simulations for each scenario, for each year, for each sub-scenario, for each network build
   b. Post process, electing sub-scenario resulting in the largest market benefit (per annum, per scenario)
   c. Time staged build based on market benefits exceeding annualised cost of the augmentation
   d. Establish optimum timing including sensitivity to discount rate
   e. Derive expected NSA costs by probability weighting the sum of NSA costs for the optimum build sequence

6 AUTHORISATION

9 / 3 / 2011

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Date

11 / 3 / 2011

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Date