

## CHAPTER 4

# Joint planning

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# 4 Joint planning

## Key highlights

- Joint planning provides a mechanism for Network Service Providers (NSPs) to discuss and identify technically feasible, cost effective network or non-network options that address identified network needs regardless of asset ownership or jurisdictional boundaries.
- Key joint planning focus areas since the publication of the 2020 Transmission Annual Planning Report (TAPR) include:
  - The changing nature of load with embedded rooftop photovoltaic (PV), improved load power factors and reducing minimum demand. This includes the challenges of managing high voltages associated with minimum demand
  - Deferral of transformer augmentation projects at Kamerunga in FNQ and Goodna in Moreton area, by Energy Queensland (EQL) load transfers – either as part of an over load management system (OLMS) or permanent transfers
  - Ensuring reliability to customers while expanding the opportunities for renewables as part of the renewable energy zones (REZ) discussions in Chapter 2.

## 4.1 Introduction

Powerlink's joint planning framework with the Australian Energy Market Operator (AEMO) and other NSPs is in accordance with the requirements set out in Clause 5.14.3 and 5.14.4 of National Electricity Rules (NER).

Joint planning begins several years in advance of an investment decision. The nature and timing of future investment needs are reviewed at least on an annual basis utilising an interactive joint planning approach.

The objective of joint planning is to collaboratively identify network and non-network solutions to limitations which best serve the long-term interests of customers, irrespective of the asset boundaries (including those between jurisdictions).

The joint planning process results in integrated area and inter-regional strategies which optimise asset investment needs and decisions consistent with whole of life asset planning.

The joint planning process is intrinsically iterative. The extent to which this occurs will depend upon the nature of the limitation or asset condition driver to be addressed and the complexity of the proposed corrective action. In general, joint planning seeks to:

- understand the issues collectively faced by the different network owners and operators
- understand existing and forecast congestion on power transfers between neighbouring NSPs
- help identify the most efficient options to address these issues, irrespective of the asset boundaries (including those between jurisdictions)
- influence how networks are managed, and what network changes are required.

Projects where a feasible network option exists which is greater than \$6 million are subject to a formal consultation process under the applicable regulatory investment test mechanism. The owner of the asset where the limitation emerges will determine whether a Regulatory Investment Test for Transmission (RIT-T) or Regulatory Investment Test for Distribution (RIT-D) is used as the regulatory instrument to progress the investment recommendation under the joint planning framework. This provides customers, stakeholders and interested parties the opportunity to provide feedback and discuss alternative solutions to address network needs. Ultimately, this process results in investment decisions which are prudent, transparent and aligned with stakeholder expectations.

## 4.2 Working groups and regular engagement

Powerlink regularly undertakes joint planning meetings with AEMO, Energy Queensland and Jurisdictional Planning Bodies (JPB) from across the National Electricity Market (NEM). There are a number of working groups and reference groups in which Powerlink contributes to:

- Executive Joint Planning Committee
- Joint Planning Committee
- Regulatory Working Group
- Forecasting Reference Group
- Power System Modelling Reference Group
- NEM Working Groups of the Energy Networks Association (ENA)
- AEMO on the 2020 PSFRR (refer to Section 8.3)
- AEMO on the Network Support and Control Ancillary Service (NSCAS)
- AEMO and other jurisdictional planners in the development of inputs for the 2022 Integrated System Plan (ISP) including submissions to the ISP Input Assumptions and Scenarios, ISP Methodology and development of ISP Preparatory Activity reports (refer to sections 9.1 and 9.3)
- AEMO National Planning to determine the minimum system strength requirements in the Queensland region and the subsequent notification of a fault level shortfall at the new Ross node
- TransGrid when assessing the economic benefits of expanding the power transfer capability between Queensland and NSW
- Energex and Ergon Energy (as part of the Energy Queensland Group) for the purposes of efficiently planning developments and project delivery in the transmission and sub-transmission network.

### 4.2.1 Executive Joint Planning Committee

The Executive Joint Planning Committee (EJPC) coordinates effective collaboration and consultation between JPBs and AEMO on electricity transmission network planning issues. The EJPC directs and coordinates the activities of the Forecasting Reference Group, and the Regulatory Working Group. These activities ensure effective consultation and coordination between JPB, Transmission System Operators and AEMO on a broad spectrum of perspectives on network planning, forecasting, market modelling, and market regulatory matters in order to deal with the challenges of a rapidly changing energy industry.

### 4.2.2 Joint Planning Committee

The Joint Planning Committee (JPC) is a working committee supporting the EJPC in achieving effective collaboration, consultation and coordination between JPB, Transmission System Operators and AEMO on electricity transmission network planning issues.

### 4.2.3 Forecasting Reference Group

The Forecasting Reference Group (FRG) is a monthly forum with AEMO and industry forecasting specialists. The forum seeks to facilitate constructive discussion on matters relating to gas and electricity forecasting and market modelling. It is an opportunity to share expertise and explore new approaches to addressing the challenges of forecasting in a rapidly changing energy industry.

### 4.2.4 Regulatory Reference Group

The Regulatory Working Group (RWG) is a working group to support the EJPC in achieving effective collaboration, consultation and coordination between JPBs, Transmission System Operators and AEMO on key areas related to the application of the regulatory transmission framework and suggestions for improvement.

### 4.2.5 Power System Modelling Reference Group

This is a technical expert reference group which focuses on power system modelling and analysis techniques to ensure an accurate power system model is maintained for power system planning and operational analysis, establishing procedures and methodologies for power system analysis, plant commissioning and model validation.

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### 4.3 AEMO Integrated System Plan (ISP)

Powerlink is working closely with AEMO to support the development of the 2022 ISP. The ISP sets out a roadmap for the eastern seaboard's power system over the next two decades by establishing a whole of system plan for efficient development that achieves system needs through a period of transformational change.

During 2021 Powerlink has provided feedback on the proposed ISP methodology and inputs, assumptions and scenarios. As requested in AEMO's 2020 ISP (published in July 2020) Powerlink has also prepared Preparatory Activity reports for two intra-regional projects and for an interconnector upgrade (refer to Section 9.3). This involvement is critical to ensure the best possible jurisdictional inputs are provided to the ISP process in the long-term interests of customers.

#### Process

Powerlink continues to provide a range of network planning inputs to AEMO's ISP consultation and modelling processes, through joint planning processes and regular engagement, workshops and various formal consultations. This engagement helps underpin the inputs, assumptions and methodology for the ISP.

#### Methodology

More information on the 2020 ISP including methodology and assumptions is available on AEMO's website.

#### Outcomes

The ISP attempts to identify a long-term plan for the efficient development of the NEM transmission network, and the connection of Renewable Energy Zones (REZ) over the coming 20 years. It is based on a set of assumptions and a range of scenarios.

### 4.4 AEMO national planning – fault level shortfall

System strength is a critical requirement for a stable and secure power system. A minimum level of system strength is required for the power system to remain stable under normal conditions and to return to a steady state condition following a system disturbance.

Under the NER, Powerlink as the TNSP and JPB for the region, has an obligation to maintain a minimum fault level at key nodes. These key nodes, and prescribed minimum fault levels, are defined by AEMO in consultation with Powerlink. Powerlink works closely with AEMO to review the Queensland fault level nodes and their minimum three phase fault levels annually to assess whether there is or is likely to be a fault level shortfall in the Queensland region, and a forecast of the period over which any fault level shortfall might exist.

#### Process

Powerlink and AEMO carried out detailed Electromagnetic Transient-type (EMT-type) analysis to determine the system strength requirements for the Queensland region. Using the outcomes from these studies (for example, minimum required synchronous generator combinations), minimum three phase fault levels at the fault level nodes are defined.

#### Methodology

AEMO applies the System Strength Requirements Methodology<sup>1</sup> to determine the Queensland fault level nodes and their minimum three phase fault levels for 2020.

More information on the System Strength Requirements Methodology, System Strength Requirements and Fault Level Shortfalls is available on AEMO's website.

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<sup>1</sup> AEMO, [System Strength Requirements Methodology and System Strength Requirements and Shortfalls](#), July 2018.

**Outcomes**

AEMO published a Notice of Queensland System Strength Requirements and Ross Fault Level Shortfall in April 2020. There were two significant changes since their initial report in 2018:

- The replacement of the Nebo 275kV fault level node with the Ross 275kV node. In consultation with Powerlink, AEMO determined that the Ross 275kV node was a better representation for system strength conditions in North Queensland (NQ) compared to the original Nebo 275kV node.
- AEMO declared an immediate fault level shortfall of 90MVA at the Ross 275kV fault level node. AEMO forecast that, if not addressed, this fault level shortfall will continue beyond 2024-25.

These outcomes and Powerlink's solution to the declared fault level short fall are discussed in sections 6.7.1 and 10.4.

## 4.5 Power System Frequency Risk Review (PSFRR)

The PSFRR is an integrated, periodic review of power system frequency risks associated with non-credible contingency events in the NEM.

**Process**

In accordance with Clause 5.20A.1 of the NER, AEMO in consultation with TNSPs prepares a PSFRR for the NEM, considering:

- Non-credible contingency events which AEMO expects could likely involve uncontrolled frequency changes leading to cascading outages or major supply disruption.
- Current arrangements for managing such non-credible contingency events.
- Options for future management of such events.
- The performance of existing Emergency Frequency Control Schemes (EFCS).

For 2020, AEMO undertook the PSFRR in two stages. Stage 1 reviewed the status of actions recommended in the 2018 PSFRR, reviewed power system events and identified non-credible contingency events and associated management arrangements to be prioritised. Stage 2, published in December 2020, included more detailed assessment and option analysis.

**Methodology**

With support from Powerlink, AEMO assessed the performance of existing EFCS. AEMO also assessed high priority non-credible contingency events identified in consultation with Powerlink. From these assessments AEMO determines whether further action may be justified to manage frequency risks.

**Outcomes**

The Final 2020 PSFRR report:

- Recommended an expansion of Powerlink's Central Queensland to South Queensland (CQ-SQ) Special Protection Scheme (SPS). The effectiveness of the existing scheme is limited to transfers up to approximately 1,700MW and relies on the ability to disconnect, up to two, high output generating units at Callide Power Stations for the unplanned trip of both Calvale to Halys 275kV feeders.
- Concluded that there was no immediate need to implement an Over Frequency Generation Shedding (OFGS) scheme as a result of the QNI Minor (refer to Section 4.6) upgrade to manage frequency increases within the frequency operating standard (FOS).
- Concluded that the existing Under Frequency Load Shed (UFLS) controls are able to manage the frequency disturbance when exporting at the secure transfer limit. However, as embedded distributed energy resources (DER) continue to increase the risk needs to be reassessed as part of the 2022 PSFRR.

In response to the PSFRR, Powerlink commissioned a project in July 2021 to implement a new Wide Area Monitoring Protection and Control (WAMPAC) scheme architecture to operate in parallel with the existing CQ-SQ SPS. The WAMPAC scheme adds the ability to trip approximately 600MW of renewable generators in north Queensland and approximately up to 700MW of load in South Queensland (refer to Section 8.3).

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### 4.6 Joint planning with TransGrid – Expanding the transmission transfer capacity between New South Wales and Queensland

In December 2019, Powerlink and TransGrid released a Project Assessment Conclusions Report (PACR) on 'Expanding NSW-Queensland transmission transfer capacity'. The recommended option includes upgrading the 330kV Liddell to Tamworth 330kV lines, and installing Static VAR Compensators (SVCs) at Tamworth and Dumaresq substations and static capacitor banks at Tamworth, Armidale and Dumaresq substations. All material works associated with this upgrade are within TransGrid's network.

AEMO's ISP continues to investigate opportunities for expansion of interconnector capacity. In the 2020 ISP, AEMO identified QNI Medium and Large projects as future ISP projects, requiring Powerlink and TransGrid to undertake preparatory activities by 30 June 2021 (refer to sections 6.9.1 and 9.3).

AEMO also flagged in the 2020 ISP that it will work with Powerlink and TransGrid to explore further options in relation to virtual transmission lines (VTLs). The 2020 ISP outlined that VTLs, coupled with suitable wide area protection schemes, could provide a technically feasible solution to increase the capacity of QNI.

### 4.7 Joint planning with Energex and Ergon Energy

Queensland's Distribution Network Service Providers (DNSPs) Energex and Ergon Energy (part of the Energy Queensland group) participate in regular joint planning and coordination meetings with Powerlink to assess emerging limitations, including asset condition drivers, to ensure the recommended solution is optimised for efficient expenditure outcomes<sup>2</sup>. These meetings are held regularly to assess, in advance of any requirement for an investment decision by either NSP, matters that are likely to impact on the other NSP. Powerlink and the DNSPs then initiate detailed discussions around addressing emerging limitations as required. Joint planning also ensures that interface works are planned to ensure efficient delivery.

Table 4.1 provides a summary of activities that are utilised in joint planning. During preparation of respective regulatory submissions, the requirement for joint planning increases significantly and the frequency of some activities reflect this.

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<sup>2</sup> Where applicable to inform and in conjunction with the appropriate RIT-T consultation process.

**Table 4.1** Joint planning activities

Activity	Frequency		
	Week-to-week	Monthly	Annual
Sharing and validating information covering specific issues	Y	Y	
Sharing updates to network data and models	Y	Y	
Identifying emerging limitations	Y		
Developing potential credible solutions	Y		
Estimating respective network cost estimates	Y		
Developing business cases	Y		
Preparing relevant regulatory documents	Y		
Sharing information for joint planning analysis	Y	Y	
Sharing information for respective works plans			Y
Sharing planning and fault level reports			Y
Sharing information for Regulatory Information Notices			Y
Sharing updates to demand forecasts			Y
Joint planning workshops			Y

#### 4.7.1 Matters requiring joint planning

The following is a summary of projects where detailed joint planning with Energex and Ergon Energy (and other NSPs as required) has occurred since the publication of the 2020 TAPR (refer to Table 5.2). There are a number of projects where Powerlink, Energex and Ergon Energy interface on delivery, changes to secondary systems or metering, and other relevant matters which are not covered in this Chapter. Further information on these projects, including timing and alternative options is discussed in Chapter 6.

**Table 4.2** Joint planning project references

Project	Reference
Kamerunga 132/22kV transformer replacement	<a href="#">Section 6.7.1</a>
275kV upgrade for Northern QREZ	<a href="#">Section 6.7.1</a>
SEQ reactive power and voltage control	<a href="#">Section 6.7.10</a>

In addition there was joint planning between Energex and Powerlink regarding an OLMS operational project at Goodna within the 10-year outlook period.

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