2018-22 POWERLINK QUEENSLAND REVENUE PROPOSAL

Supporting Document - PUBLIC

Powerlink Queensland
Joint Planning Framework

Delivering better value

Powerlink – Joint Planning Framework

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1. Introduction

1.1 Purpose

The purpose of this document is to provide an overview of the joint planning framework adopted by Powerlink in relation to its interactions with other network service providers (NSPs) in accordance with the requirements set out in the National Electricity Rules (Rules). The objective of joint planning is to collaboratively identify solutions to identified network limitations, which best serve the long term interests of customers and consumers.

1.2 Defined terms

Terms	Definition
NER	National Electricity Rules (The Rules)
RIT-T	Regulatory Investment Test for Transmission
RIT-D	Regulatory Investment Test for Distribution
TAPR	Transmission Annual Planning Report
DAPR	Distribution Annual Planning Report
TNSP	Transmission Network Service Provider
DNSP	Distribution Network Service Provider
NSP	Network Service Provider
AER	Australian Energy Regulator
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
NEM	National Electricity Market
NTNDP	National Transmission Network Development Plan
PSCR	Project Specification Consultation Report
PADR	Project Assessment Draft Report
PACR	Project Assessment Conclusion Report

2. Framework

2.1 Regulatory Obligations

Powerlink's Transmission Authority authorises it to operate the high voltage transmission network in Queensland under the Electricity Act 1994 (Queensland). Powerlink is also registered as a Transmission Network Service Provider (TNSP) under the Rules, which govern the operation of the NEM.

Under the Queensland legislation, Powerlink has responsibility to plan for future Queensland transmission needs, including interconnection with other networks. These planning responsibilities are prescribed in the Rules, the Electricity Act 1994 (Queensland) and in Powerlink's Transmission Authority.

In terms of joint planning activities, the Rules (Chapter 5.14) provide that:

Where the need for an augmentation or a non-network alternative is identified (either by the annual planning review or independently of that review), the relevant parties must undertake joint planning in order to determine plans for consideration by relevant Registered Participants, AEMO and interested parties. For this purpose, the relevant parties are:

(1) For the declared shared network of an adoptive jurisdiction – the relevant declared transmission system operator, the relevant Distribution Network Service Provider, AEMO and any interested party that has informed AEMO of its interest in the joint planning process; and

(2) For any other case – the relevant Network Service Providers.

2.2 Joint Planning Engagement

At an overarching level, the joint planning process facilitates the identification, review and resolution of options to address emerging network limitations from a whole of network perspective. In the context of joint planning, TNSP/DNSP boundaries (including those between jurisdictions), are irrelevant.

Consistent with the National Electricity Objective, joint planning seeks to ensure the most efficient outcomes for customers are implemented, which is often a combination of TNSP and DNSP investments. 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.

Joint planning between Powerlink and relevant NSPs begins many years in advance of an investment decision being made. The nature and timing of future investment needs are jointly reviewed on an annual basis utilising an interactive joint planning approach. However, the frequency of interactions in relation to particular needs increases as the time for action to meet the need approaches.

The joint planning process is intrinsically iterative, and the extent to which this occurs will depend upon the nature of the limitation to be addressed and the complexity of the proposed corrective action. The information flow diagram in Appendix A illustrates the various inputs to, and considerations associated with the joint planning process.

In a general sense, the Joint Planning initiative seeks to:

- understand the issues collectively faced by the different networks;
- understand existing and forecast congestion on power transfers between neighbouring regions;
- help identify the most efficient options to address these issues;
- influence how the networks are managed, and what network changes are required; and
- help clarify the investment decisions which are likely to be progressed.

2.3 Consultation

The early identification of emerging network limitations and/or transmission congestion, asset reinvestment triggers and prospective network developments, including easement acquisition, is important to ensure that the appropriate consultations can occur within the relevant timeframes. This information is currently made available to stakeholders via the NSPs Annual Planning Reports and AEMOs National Transmission Network Development Plan.

Projects that are justified through an economic analysis and are greater than $5 million are subject to a formal consultation process under the applicable regulatory investment test mechanism. 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 align with stakeholder expectations.

2.4 National Transmission Network Development Plan (NTNDP)

The NTNDP is published by the Australian Energy Market Operator (AEMO) and is intended to provide an independent strategic plan for the NEM transmission network. It is also designed to offer nationally consistent information on transmission capabilities, congestion and investment options for a range of credible market development scenarios.

In developing the NTNDP, TNSPs provide information to AEMO on conceptual augmentations upon which AEMO undertakes scoping studies and market simulations to forecast flow path utilisation and congestion over a 20-year outlook period.

2.5 Transmission and Distribution Annual Planning Reports

The Rules (Chapter 5.14) requires that TNSPs and DNSPs publish information on forecast loads, planning proposals for future connection points, forecast constraints as well as specific information in relation to all proposed augmentations to the network. This information is released annually, with an outlook of 1, 3 and 5 years into the future.

The early provision of this information to the market is specifically aimed at providing appropriate lead times for proponents of alternative solutions (including non-network) to develop proposals. Among other things, Annual Planning Reports are aimed at providing information to inform and assist interested parties to:

- identify locations that would benefit from significant electricity supply capability or demand side management initiatives;
- identify locations where major industrial loads could be connected;
- understand how the electricity supply system affects their needs;
- consider the transmission network's capability to transfer quantities of bulk electrical energy; and
- provide input into the future development of the transmission network.

2.6 Transmission Planning Criteria

Powerlink's planning obligations are prescribed by Queensland's Electricity Act 1994, the National Electricity Rules and Powerlink's Transmission Authority, issued by the Queensland Government. In April 2014, the Queensland Government advised that Powerlink's electricity network reliability standards would be amended to remove the obligation to deliver on the N-1 planning standard by including an allowance to place a limited amount of load at risk.

Powerlink's Transmission Authority was consequently amended to permit the interruption of up to 50MW of load and no more than 600MWh of energy, following a credible contingency event. Powerlink's Transmission Planning Criteria has been updated to reference this standard, referred to as the "N-1-50" planning standard.

While NSPs plan their networks individually to comply with their own planning criteria, consideration is given at the joint planning level to ensure there is acknowledgement of the standards applied by each other in the overall development of the networks. In general, the joint planning engagement process will facilitate the most economic solution to address a breach of NSP planning criteria.

3. The Joint Planning Process

The joint planning process comprises four discrete phases, with each phase progressively narrowing in scope while becoming more detailed. The individual phases of the process are identified below.

Figure 1: Overview of the Joint Planning Process

3.1 Identification of Network Needs and Development of Initial Options

Routine network analysis is undertaken by Powerlink (and DNSPs) to identify system limitations and congestion as part of the normal planning cycle. These studies consider changes in network topology which may be driven by load or condition related triggers. Initial solutions are developed, and proposed network changes are presented during the joint planning engagement sessions so that potential investment decisions can be shared and optimised.

3.1.1 Screening Studies

A series of exploratory investigations, also referred to as screening studies, focus on transmission network performance projections under a range of future scenarios to identify congestion, potential limitations, and their timing. The objective is to find all potential limitations via modelling simplifications (such as deterministic triggers) that enable the assessment of a large range of future conditions.

The assumptions and techniques applied at this stage tend to be conservative, favouring higher demand growth, and worst-case generation outcomes. The purpose of this stage is the early identification of potential network limitations. These investigations provide information about the future conditions or triggers that will cause particular limitations to arise, and when future work needs to be undertaken. Screening studies identify emerging limitations by assessing network performance in terms of security and performance obligations under a range of different power system configurations.

Security and performance obligations define the transmission system's technical limitations, for example voltage ranges, stability limits, maximum fault currents, and fault clearance requirements. These obligations ensure that connected assets (and the power system itself) are designed to operate within known technical limits. Typically, screening studies are undertaken for a base case and a worst case scenario, in order to capture a wide-range of emerging limitations.

The screening studies have two main aims:

- The identification of emerging transmission network limitations that will lead to a failure to comply with power system operational requirements.
- A focus on identifying transmission network limitations that, without re-dispatch or a pre-contingent loss of load, will lead to an unsatisfactory operating state or an insecure operating state under N and N-1 conditions. Where appropriate, consideration will be given to quantify the impact of a prior outage of the most critical network element.

AEMOs NTNDP will provide input to identification of (material) emerging congestion that may warrant joint consideration with neighbouring TNSPs. Other screening inputs may include monitoring of the fundamental inputs that may impact inter-regional power transfer requirements.

3.1.2 Reliability Triggers

The *screening* studies consider three power system configurations:

- N conditions (system normal), when all system components are in service.
- N-1 conditions, which follow a single credible contingency.
- N-1-1 conditions, which follow a single credible contingency with a prior outage (either forced or planned).

The power system is required to be operated in a satisfactory state at all times, and must be able to return to a secure operating state within 30 minutes following any credible contingency event. As defined by the NER:

- A satisfactory operating state requires (amongst other requirements listed in Chapter 4 of the NER) all network elements to be loaded within their ratings (accounting for time dependency in the case of emergency ratings).
- A secure operating state requires the power system to be in a satisfactory operating state and be able to return to a satisfactory operating state following the occurrence of any credible contingency event.

These investigations enable the development of a range of high level feasible network and non-network solutions to address the potential limitations identified in the screening studies. These high level solutions are developed only to the point where they can be shared and developed further though the joint planning process.

3.2 Joint Planning Engagement and Detailed Option Development

Joint planning focuses on network capability, congestion, asset condition drivers and future network needs. The key activities undertaken during these sessions relate to:

- understanding and alignment on energy and demand forecasts;
- analysing the performance of the existing transmission and distribution networks;
- identifying current and emerging transmission and distribution issues;
- integrating asset management strategies into the planning process;
- management of ongoing and new customer connection enquiries;
- consultations undertaken with customers on network planning strategies; and
- establishment of long-term network development strategies.

Joint planning for future network development focuses on optimising the network topology based on consideration of existing and future network needs. This is driven by forecast demand, new customer supply requirements, existing network configuration and condition based risks related to existing assets.

Once an initial, high level suite of options have been developed to address an emerging network limitation, workshops/ discussions are held to identify and jointly develop the most feasible options to address the need. As a first pass, this approach allows for the emergence of a wide range of potential network and non-network solutions to address the need. Options are assessed on individual merits and ranked on the basis of practicality, economic, technical, environmental, or other factors. This is an iterative process and data is frequently updated and modified as system conditions evolve.

During this collaborative process, a short-list of potential network and conceivable non-network options are developed and detailed power system studies are undertaken to determine each option’s effectiveness in addressing the limitation. For each technically feasible solution, a high-level cost estimate and the likely lead time to implement the option are estimated. The required time for action depends on the costs incurred due to the limitation and the cost and implementation lead time of the available solutions. For each credible network and non-network option the various classes of (material) market benefits must be assessed such that the option recommended is one that maximises the net present value of the market benefits.

Due to the uncertainties surrounding demand growth and generation investment, the detailed analysis required for transmission investment decisions is not undertaken significantly in advance of an emerging need.

Factors taken into account when developing a list of potential solutions are discussed further below.

3.2.1 Energy and Demand Forecasts

In accordance with the Rules, Powerlink coordinates a state-wide electricity demand forecast on an annual basis. Electricity demand forecasts are obtained from DNSPs and directly connected customers at each transmission connection supply point over a 10-year horizon. The forecasts take into account the demand management programs already in place or foreseen by the DNSP's as well as embedded generation, which may reduce the forecast demand to be supplied via each transmission connection point.

Although forecasts are developed independently by each NSP, measures are taken during the option development process to ensure that all proposals are reasonably aligned and have the ability to address the requirements of individual organisation forecasts.

3.2.2 Existing or Future Easements and Sites

The need for, and availability of, easements and substation sites are considered in the context of requirements for the possible network developments specifically under consideration as well as from a strategic long-term planning perspective, consistent with good industry practice. This allows Powerlink/DNSPs/TNSPs to coordinate works in identified areas where appropriate with the forecast development plans of other relevant stakeholders, including State government and local councils.

To the extent practicable, Powerlink also aims to discharge its responsibilities minimising community disruption.

3.2.3 Area Planning Strategy and Approach

An integrated network development strategy is pursued in order to optimise investment needs and decisions that are consistent with whole of life asset planning, Powerlink's corporate objectives and priorities, and aligned with stakeholder expectations. Collective groupings of assets (often within the same geographic area) are identified where future network development and reinvestment strategies need to be developed in consideration of relevant inputs highlighted during the joint planning process.

Where an asset has reached the end of its technical or economic life, the potential to decommission the asset exists if an enduring need for the asset cannot be established. Alternatively, it may be more cost effective to reconfigure the network, taking into account existing and future capacity requirements in both the TNSP's and other NSP's networks.

In essence, the area planning approach will capture:

- consolidation opportunities, including augmentation driven upgrades and network reconfiguration, and the forecast of customer electricity demand and generation scenarios;
- condition of assets and an assessment of the risks associated in allowing assets to remain in-service; and
- asset replacement and refurbishment plans and other long term network development plans.

3.2.4 Integration of Renewable Energy Sources

Renewable energy penetration has increased substantially in recent years due to environmental issues, policy change and fossil fuel costs. Conventional synchronous generation provides the required frequency control and regulation to maintain secure operation of the power system. It enables fast acting voltage and frequency control, and contributes to inertia and fault level, irrespective of output levels. Most forms of wind and PV based generation technologies are non-synchronous, and provide these services at a low level or not at all.

In general, large scale power generation favours transmission connection whereas small scale distributed power generation is connected to distribution systems. Ultimately, this energy must be transported to load centres either locally (via the distribution network) or remotely (via the transmission network).

An increased uptake of renewable forms of generation will present challenges to transmission and distribution businesses as they continue to displace conventional forms of generation. As these challenges become better understood though utility collaboration at a local, national and international level, they will be incorporated into, and addressed though appropriate network solutions.

3.2.5 Consideration of Emerging Technologies

The energy industry is being transformed by technological advancements which are changing the generation mix and creating opportunities for increased consumer engagement when it comes to choice and energy supply solutions. Battery storage and electric vehicles continue to gather momentum internationally and in Australia, with industry and consumers keen to explore the opportunities and challenges presented by these new technologies.

- Large scale penetration of new technologies can occur over a short period of time.
- Early monitoring is critical to understanding the potential impact and implications of emerging technologies and trends on annual operational consumption and maximum demand from the national electricity grid.
- Modelling future uptake is challenging, and is greatly assisted by appropriate resources for collecting data about the adoption of emerging technologies and trends.

3.2.6 Initial Market Impact Studies

Market impacts derive from the fact that AEMO will restrict power flows across transmission network elements when there is a risk of exceeding their defined limits for N and N-1 conditions, and to ensure the power system operates within its performance requirements.

There are two key operational actions, in terms of value or cost to the market:

- Energy not supplied to customers, for example, through load reduction (unserved energy).
- Re-dispatched generation energy (generation re-dispatch).

These studies will also establish if the market benefits of any of the available solutions will be greater than their costs within the time they will take to plan, procure and implement. Depending on the outcome, a deferral of network investment may be recommended until an investment is economically viable (when the benefits outweigh the costs).

3.3 Joint Delivery of Final Options, Costing, Sequence and Timing

Having undertaken the iterative process of developing and considering options in light of sequencing, network impacts, the coordination of works, cost and new information, a smaller number of options emerge. These options will be technically and economically feasible to address the identified need within the timeframe. More detailed estimates of these options are developed for use in the final economic analysis.

3.3.1 Modelled Projects

The joint planning framework will also identify a number of anticipated and modelled projects associated with each of these options which are expected to be required to continue to meet reliability obligations during the forecast planning horizon. Further analysis is also undertaken to finalise the sequencing of the options and possible future developments.

3.3.2 Market Benefits

Once established, a limitation's annualised cost can be compared with the annualised cost of the feasible solutions. The year a limitation's annualised cost becomes larger than the solution's annualised cost is the year the net present value of market benefits is maximised, representing the solution's optimal timing.

At this stage, further market modelling studies may determine the benefits associated with particular solutions and to further narrow down the time for action. If the estimated time for action is within the planning timeframe (the time required to plan, procure and implement the solution) a final Joint Planning Report is produced.

3.4 Compliance with Statutory Governance

As a regulated network business, Powerlink is obliged (under the Electricity Act 1994, National Electricity Law and the National Electricity Rules) to ensure its high-voltage electricity transmission network can reliably and economically meet growing electricity demand. The application of the Regulatory Investment Test for Transmission (RIT-T) ensures for the majority of scenarios, the recommended solution is the most economic option to meet reliability standards as the demand for electricity grows.

Chapter 5.14 of the Rules requires that consultation be undertaken to demonstrate that, for reliability augmentations, the recommended option minimises the present value of costs in a majority of credible scenarios in line with the RIT-T.

The outcomes of the joint planning process form the basis upon which public consultation under the AER's Regulatory Test is conducted. Where material issues arise during the consultation process, further joint planning discussions/analysis may be undertaken prior to finalising and publishing the Application Notice and Final Report.

All Regulatory Test public documents are reviewed, agreed and branded by all parties to the joint planning framework.

- Stage one involves preparing a Project Specification Consultation Report (PSCR). The PSCR informs the market of the upcoming network limitations and potential solutions, with a focus on providing information to proponents of non-network solutions.
- Stage two involves preparing a Project Assessment Draft Report (PADR). The PADR presents the results of the economic cost-benefit test and identifies the preferred investment option for consultation.
- Stage three involves preparing a Project Assessment Conclusions Report (PACR). The PACR recommends an investment.

3.5 Final Project Approval and Implementation

Final project approval and implementation is undertaken consistent with Powerlink's capital project approval process.

4. Distribution list

Internal	Contact details
☐ Finance and Business Performance	
☒ Investment and Planning	[redacted]
☐ Infrastructure Delivery & Technical Services	
☐ Operations and Field Services	
☐ People and Culture	
☐ Stakeholder Relations and Corporate Services	
Other	**Contact details**
☐ ENERGEX	
☐ Ergon Energy	

Appendix A – The Joint Planning Process Information Flow

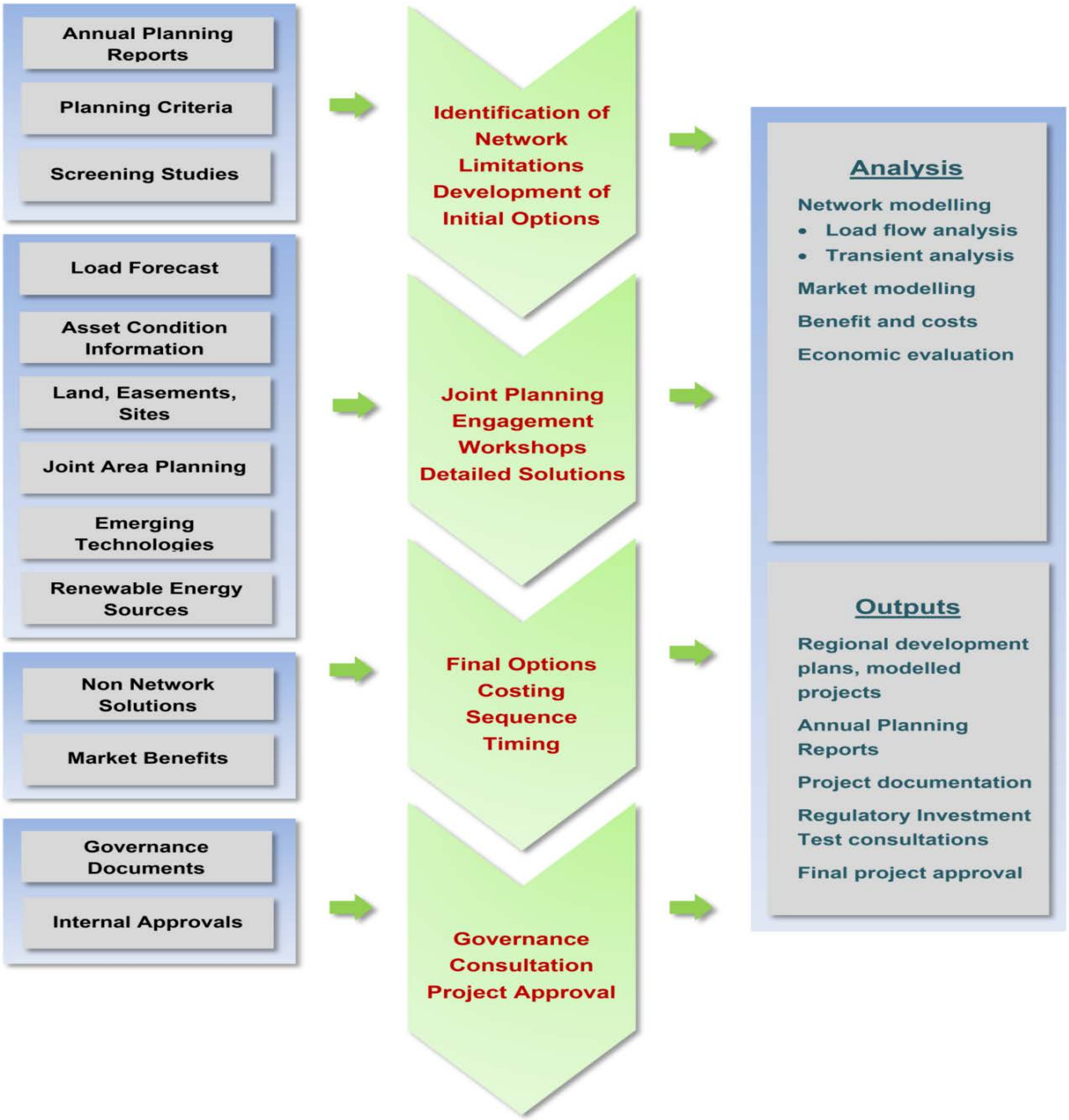

Figure 2: Overview of Joint Planning Process Information Flow Diagram