2023-27
POWERLINK QUEENSLAND REVISED REVENUE PROPOSAL

Appendix 17.02 – PUBLIC

Powerlink Background Material on DMIAM

Purpose and engagement scope

This document has been prepared to inform engagement at our 17 September 2021 Revenue Proposal Reference Group (RPRG) meeting about the application of the Demand Management Innovation Allowance Mechanism (DMIAM) for Powerlink's 2023-27 regulatory period and to respond to feedback received from customers on this matter.

Powerlink proposes to engage at the Empower level of the International Association of Public Participation (IAP2) spectrum in relation to this matter.

Engagement at the Empower level means we propose to ask our Customer Panel to make a decision as to whether we should seek to apply the DMIAM in our 2023-27 regulatory period, or not, in our Revised Revenue Proposal. We will then implement the decision that our Customer Panel reaches.

We propose to engage at the Empower level for two primary reasons:

- to ensure our position in relation to this matter directly reflects customer views, which has always been our intent; and
- Powerlink is genuinely open to implementing either option (apply or do not apply).

We intend to ask a preliminary view from our RPRG/Customer Panel at the 17 September 2021 meeting and request the Customer Panel provide their decision by our next meeting on 22 October 2021.

Background

On 9 July 2021 Powerlink wrote to the Australian Energy Regulator (AER) to request to the Demand Management Innovation Allowance Mechanism (DMIAM) not be applied to Powerlink in the AER's forthcoming Revenue Determination for Powerlink's 2023 – 27 regulatory period. In requesting that the DMIAM not apply to Powerlink we had regard to the following matters:

- we want to drive a culture with the business of continually seeking innovative ways to improve customer outcomes, not just tied to specific funding streams;
- we don't want to charge customers for things we should be pursuing through the normal course of our business, including through use of our innovation framework; and
- our approach to no real growth in operating expenditure includes a level of constructive discomfort within the business to continue to live within our means.

Since making this request to the AER we have continued to engage with our customers, the AER and the AER's Consumer Challenge Panel (AER CCP23) on this matter. Key items of feedback we have received through this engagement are:

- interest in what work we are already doing in the demand management space and how we are responding to demand management issues as part of business-as-usual, particularly given the trends of increasing maximum demand, decreasing minimum demand and declining energy throughput; and
- how learnings and innovations are shared with customers and other network businesses, which is a key feature of the DMIAM.

Powerlink's existing demand management initiatives

Introduction

We work closely with customers, regulators, the Queensland Government, project proponents, suppliers, Energy Queensland Limited (EQL) and the Australian Energy Market Operator (AEMO) to identify, understand and appropriately respond to a range of challenges currently facing the energy sector.

From a demand management perspective, our work includes:

- involvement in a joint working group with AEMO and Energy Queensland to study and propose actions to address broader power system challenges related to minimum demand;
- investigating mechanisms with Energy Queensland to address minimum demand and related voltage and reactive power control issues within the South East Queensland network, such as voltage control devices;
- joint research with AEMO to better understand the changing nature of customer load and develop models to more accurately determine the secure operating envelope of the power system and capability of power system assets;
- support for Collaborative Research Centres (CRCs), such as the Reliable Affordable Clean Energy (RACE) for 2030 CRC, to influence research directions to facilitate future deployment at the transmission level; and
- partnering with proponents and Original Equipment Manufacturers (OEMs) to locate Battery Energy Storage Systems (BESS) in areas of the network where future power system needs and services can be most effectively leveraged.

We provide further detail about each of these initiatives in the following sections.

Falling minimum demand

The problem of high voltages is an emerging limitation that occurs in the early morning and during the minimum daytime demand. The main drivers behind the higher voltages on the transmission network are low demand on the transmission system and the export of increasing levels of reactive power into the transmission network from the distribution network.

Powerlink, the Australian Energy Market Operator (AEMO) and Energy Queensland Limited (EQL) have investigated the merits of time-shifting electric hot-water load to the daytime to increase the minimum daytime demand and reduce the exposure to high voltages in South East Queensland (SEQ). The EQL Demand and Energy Management team has completed preliminary analysis into options for time shifting of these controlled loads and concluded that there will not be any material benefit.

A Powerlink, AEMO and EQL joint working group is also studying broader power system challenges relating to minimum demand and the future timing of those challenges. This study will be extended to develop a detailed action plan to address those challenges. The resulting action plan is intended to be delivered collaboratively by AEMO, Powerlink, EQL and the Queensland Government.

Powerlink and EQL have investigated mechanisms to address minimum demand and related voltage and reactive power control issues within the Far North Queensland (FNQ) network. This work has identified that changes to distribution transformer setting within the EQL network in the Cairns area can address the immediate issues, and avoid the need for more expensive network investment.

Powerlink and EQL have also investigated mechanisms to address minimum demand and related voltage and reactive power control issues within the SEQ network. A range of potential options to manage these load situations have been identified, including voltage control devices on the EQL network and Powerlink network. Powerlink has initiated a Regulated Investment Test for Transmission (RIT-T) to address the issue and is seeking non-network alternatives.

Changing characteristics of customer load

A Powerlink and AEMO working group is conducting research to better understand the changing nature of customer load and developing bottom-up / top-down dynamic composite and DER load models. The models will ultimately be used to more accurately determine the secure operating envelope of the power system and maximise the capability of existing power system assets.

An improved understanding of the nature of distribution loads (including roof top PV and changes in reactive components) will enhance information on the required technical characteristics of potential non-network solutions. It will also form part of modelling for wide area monitoring and control systems that can use non-

network components (ie generation, load and battery systems) to enhance the performance and capability of the transmission system.

Research and development

Powerlink is supporting a new decade-long research partnership working to improve energy affordability and reliability, and lower national carbon emissions. The Reliable Affordable Clean Energy (RACE) for 2030 Cooperative Research Centre (CRC) is a collaboration between Australian universities and the energy industry to drive energy innovation across the supply chain to deliver better value for energy customers. The CRC will undertake projects under four main themes of business, homes, networks and everyone, which would support network utilisation, operability and customer awareness.

We have also committed to the Enabling the Queensland Power System of the Future project with the University of Queensland, which seeks to perform analysis and develop tools that will assist with investigations into emerging power system security issues.

Battery Energy Storage Systems

Powerlink is working and partnering with proponents and equipment manufacturers to locate Battery Energy Storage Systems (BESS) in areas of the network where future power system needs and services can be most effectively leveraged for the most economic outcome for customers and proponents alike. Potential network services that Powerlink has identified include reactive power support, dynamic voltage support, system strength and inertia, and Virtual Transmission Lines (VTL) when paired with wide area control schemes. Powerlink has initiated an Expression of Interest (EOI) seeking interest from proponents that can help with this process.

Knowledge Sharing

Introduction

At Powerlink, we recognise that the value of this work can only be maximised if others can learn from it, build on it, and continue to pursue further improvements. To support this cycle of continuous improvement it is important that we share the knowledge we gain from our activities, where we are able to do so. We utilise a range of channels to share knowledge:

- joint planning with EQL, AEMO and TransGrid to collaborate in the development of efficient solutions to meet emerging power system needs;
- active participation in a number of AEMO convened information sharing forums, including the Forecasting Reference Group (FRG), Planning Reference Group (PRG) and Plant Modelling Reference Group (PMRG);
- contribution to CIGRE, which is a global community committed to the collaborative development and sharing of power system expertise; and
- publication of one-off research activities such as Australian Renewable Energy Agency (ARENA) grant research.

Joint planning activities

Joint planning between interconnecting networks, and with AEMO, provides the mechanisms where Powerlink can share technical learnings gained through our business as usual activities with other network businesses. This applies not only to identifying feasible network solutions, but extends to non-network solutions. In the past we have shared our experiences in contracting for non-network solutions with other networks, including with TransPower in New Zealand.

Participation in NEM forums

Powerlink staff are active participants in a number of critical information sharing forums that operate across the National Electricity Market (NEM). Our staff have been critical to advancing the understanding of system strength issues and the development of innovative and low cost solutions, such as inverter retuning. We also contribute our knowledge and expertise to Australian Energy Market Commission (AEMC) reference groups during Rule change development processes.

CIGRE

CIGRE operates the world's foremost power system knowledge programme, spanning 16 domains of work encompassing all the core areas of the power system. Powerlink encourages its staff to submit papers to CIGRE conferences, where they can engage in learned discussions with the worlds experts on all aspects of modern power systems. Most recently, two Powerlink staff contributed papers to the CIGRE Paris Session in 2020.

Australian Renewable Energy Agency (ARENA) research

In 2019 Powerlink was awarded an ARENA research grant in conjunction with other partners to investigate technical, commercial and regulatory solutions to cost effectively address system strength challenges. The research covered scale efficient shared system strength services, grid forming BESS, and impacts on system strength. The research was published providing information and resources for utilities and proponents across the NEM.

Other knowledge sharing

Powerlink is an active member of Energy Networks Australia (ENA), the national industry body representing Australia's electricity transmission and distribution and gas distribution networks. Through the Asset Management Committee of the ENA we contribute to sharing knowledge that promotes best practice in energy infrastructure asset management. This includes industry innovation, research and development, demand management and the integration of embedded generation.

Powerlink collaborated and partnered with a manufacturer of large-scale photo-voltaic systems, to develop inverter level reactive power and voltage (QV) control systems. This type of control was found to be effective in reducing control interactions between various dynamic plants and increases Inverter Based Resource (IBR) hosting capacity. This methodology was shared and adopted in north western Victoria to address system strength issues and constraints on already commissioned IBR plants.

Powerlink also collaborated and partnered with a manufacturer and proponent of a wind farm and solar farms to implement control system changes. This resulted in a cost effective non-network response to the fault level short fall declared by AEMO within the north Queensland transmission network.

DMIAM – Customer Panel response

This document has been prepared as a brief response to a question from our Customer Panel about projects Powerlink considered to date for the Demand Management Innovation Allowance Mechanism (DMIAM) and why these projects are appropriate to be progressed under other mechanisms.

Our Revenue Proposal noted that the scale of electricity transmission infrastructure and the large quantities of energy being transported across the transmission network can mean there are fewer opportunities for demand management to provide a suitable alternative to network investment[1].

Given this, we stated that our initial thinking is to explore how we might be able to harness demand management capability to extend existing transmission network limits sometime in the future[2], and that we want to ensure that such initiatives are not already captured or better catered for under our operating expenditure or other relevant incentive schemes[3].

Our Revenue Proposal further identified some conceptual demand management projects that we may explore further[4]. At our Customer Panel meeting on 12 May 2021, we also identified the potential to explore initiatives to address minimum demand issues, such as research of incentive structures to encourage electric vehicle charging to fill demand troughs[5]. We have grouped these conceptual ideas into three broad categories to explain how and why we think they could be progressed outside of the DMIAM.

Category		Potential identified projects
1	Harness very fast acting resources, such as batteries, to extend existing transmission network limits	• Co-ordinate charging and discharging of batteries at either end of a transmission line or transmission corridor to operate as a virtual transmission line • Trigger a mode change on a battery as part of a System Integrity Protection Scheme (SIPS), as an alternative to tripping other generation or load • Co-ordinate fast acting batteries with slower response resources, such as embedded generation, to facilitate slower response resources contributing to address power system stability limits.
2	Access demand management resources on distribution networks to improve transmission network outcomes	• Establish high speed two-way communications between existing transmission network control schemes and distribution connected resources.
3	Addressing minimum demand	• Investigate pricing and other incentives to encourage electric vehicle charging to fill demand troughs.

Projects in category one may be suitable to be progressed through the Network Capability Component (NCC) of the Service Target Performance Incentive Scheme (STPIS) as a source of additional operating and/or capital expenditure funding, and we would consider such projects within the 2023-27 regulatory period. Extending transmission network limits can be expected to deliver immediate benefits to customers through improved wholesale market outcomes, such as reduced congestion. The NCC encourages Transmission Network Service Providers (TNSPs) to identify suitable low cost one-off operational and capital expenditure projects that improve the capability of the transmission network at times when it is most needed[6].

[1] 2023 – 27 Powerlink Queensland Revenue Proposal, p167
[2] *Ibid*
[3] *Ibid*
[4] *Ibid*
[5] Presentation available at: www.powerlink.com.au/customer-panel
[6] Electricity TNSP service target performance incentive scheme, Final Decision, September 2015, AER, p7

Projects in category two may need to occur in any event to provide ourselves and the Australian Energy Market Operator (AEMO) with the tools needed to maintain power system security in a rapidly evolving energy transition. It is increasingly important to enhance TNSP and AEMO visibility of key resources within distribution networks. Communications facilities to provide visibility will likely also allow for two-way communication across network boundaries. If that is the case, we will prioritise these activities against other capital and operating expenditure within our overall allowances.

Projects in category three would be likely to be progressed jointly with Energy Queensland, either as part of our normal joint planning and development activities, or separately funded and researched through the Australian Renewable Energy Agency (ARENA), a Cooperative Research Council (CRC) or similar.