Purpose

To outline insights gained on transmission load flexibility, including the opportunities, challenges and trade-offs identified through Powerlink's analysis.

These insights draw on extensive engagement with networks, subject matter experts, customers and aggregators, and are documented in a paper accepted for presentation at the CIGRE Paris Session in August 2026.

Context

Powerlink has been exploring how flexible demand can support transmission network utilisation and defer augmentation.

Historically, load has been treated as 'firm' and largely uncontrollable. This has led to networks being required to meet peak demand at all times. As a result, the network has higher utilisation at times of peak demand, but there is **latent network capacity**[1] at other times.

There is increasing potential for loads to operate more flexibly, supported by enabling technologies and changing operating practices. This creates an opportunity to use load flexibility to increase utilisation of existing infrastructure and defer network augmentation.

Powerlink is focusing initially on large transmission-connected loads, as they are fewer in number and larger in scale, making reliable response more practicable. Note that, across the electricity industry, significant effort is already underway to harness flexibility from consumer energy resources (at a distribution level).

Key insights

Increasing load flexibility does not automatically help the network

Flexible load capability is growing, but how that capability impacts the network and the requirement for future investment can vary widely depending on use. Flexible load behaviour is currently dominated by the concept of price responsiveness, which does not always align with transmission network needs. This is because:

- **Market signals do not reliably reflect local network conditions.** In the National Electricity Market, prices are set at the state (i.e. 'region') level a, while network limitations are more local. When a load responds to this price (as the market intended) they may unknowingly contribute further to local network constraints.
- **Networks require a reliable response.** Price-responsive load is not always predictable and the response is not guaranteed. This means Powerlink, as transmission system operator, cannot rely on load response in this form to offset network investment. To meet this need and to offset network

[1] Latent network capacity is existing network capacity that is physically available but unused at a point in time. Latent network capacity exists because the network must be planned and built to continue operating after a fault while still meeting maximum demand.

investment, Powerlink must be certain that loads that are **locationally relevant to a network limitation** will be **available to (and will) respond when required**.

Two forms of flexibility that can unlock latent network capacity

1. **Congestion service**, sometimes referred to as 'demand response,' is curtailment or consumption reduction during identified periods of network constraint.
2. **Contingency service**, sometimes referred to as 'rapid runback or tripping,' is rapid demand reduction following a network event.

These services can contribute to network value and limit network investment by allowing:

- The network to be operated closer to its physical limits more of the time and
- Additional load to be connected/supplied without augmentation

Load flexibility develops over time, but transmission needs are often step-changes and time-bound.

There is a mismatch between the step-change approach to resolving identified network needs and the gradual increase in flexible load capability. Transmission networks often require solutions to network needs at specific points in time and in specific locations, whereas a load's capability to be flexible typically develops gradually, making it harder to meet those needs when they arise.

As a result, there has been limited success in identifying and progressing load flexibility as a solution to transmission needs, particularly where price-based, one-off procurement approaches are used (e.g. the Regulatory Investment Test for Transmission (RIT-T)).

Customer capability and interest vary

Customer capability and interest in providing flexibility varies significantly. It largely depends on:

- Plant design and operational constraints
- Commercial drivers and risk appetite
- Stage in the asset lifecycle.

Interest is generally higher where flexibility is already embedded in the commercial operating model or can be incorporated early in facility design.

Engagement with customers highlighted several practical considerations:

- Flexibility can introduce operational, safety and commercial risks
- Energy is important for most customers but not their core business
- Highly reliable ('firm') network access can be more valuable than flexibility incentives
- Capability, interest, commercial model and operating model vary widely across customer types.

Customers have been open to engagement, but are seeking clarity on:

- What the network needs (including participation terms and conditions)
- What the practical requirements for participation are, including operational changes
- Whether the value being contemplated will reflect the risk and costs of participation.

Key trade-offs

Key trade-offs identified through the exploration of load flexibility services include:

- Loads value the ability to choose whether and how they respond; Networks value certainty that loads will respond to network needs.
- Loads value certainty about when and how the network will use their flexibility; Networks value minimal limitations on use.
- Loads are not homogenous; Networks value standardisation.
- Loads prefer persistent incentives with gradual participation and commitment; Networks value measurable benefits before implementation.
- Loads value simplicity and stability of arrangements; Networks value capability to manage changing local network conditions over time.

Implications

Realising the value of transmission-level load flexibility will require:

- Mechanisms that provide reliable response that can be incorporated into network planning
- Incentives that support gradual development of capability from loads
- Early engagement with customers
- Careful design to balance efficiency, fairness and practicality
- Alignment with market and regulatory arrangements.

The trade-off between stable incentives and targeted network value

There is uncertainty about where and when demand flexibility will emerge, and while highly location-specific signals are possible, they are likely to vary over time and not provide the stable incentive needed to support investment. As a result, more uniform and stable incentives may be required, even though they may drive flexibility in locations or times where it has less immediate value to the network.

Conclusion

Flexible demand presents an opportunity to increase utilisation of the existing transmission network and defer augmentation. Realising this opportunity depends on enabling response that can be relied on in planning and operations. This cannot be achieved through existing market responses alone.

Instead, it requires incentives that align with the needs of the transmission network and support uptake and participation over time. Progress is likely to be incremental, reflecting the gradual development of customer capability and the need to balance efficiency, fairness and practicality.

Additional resources

- Paris Session 2026 | Session CIGRE
- Powerlink Queensland 2027-32 Revenue Proposal – RPRG Briefing Paper - DMIAM
- AEMC - Review of the Wholesale Demand Response Mechanism (WDRM) - Final report