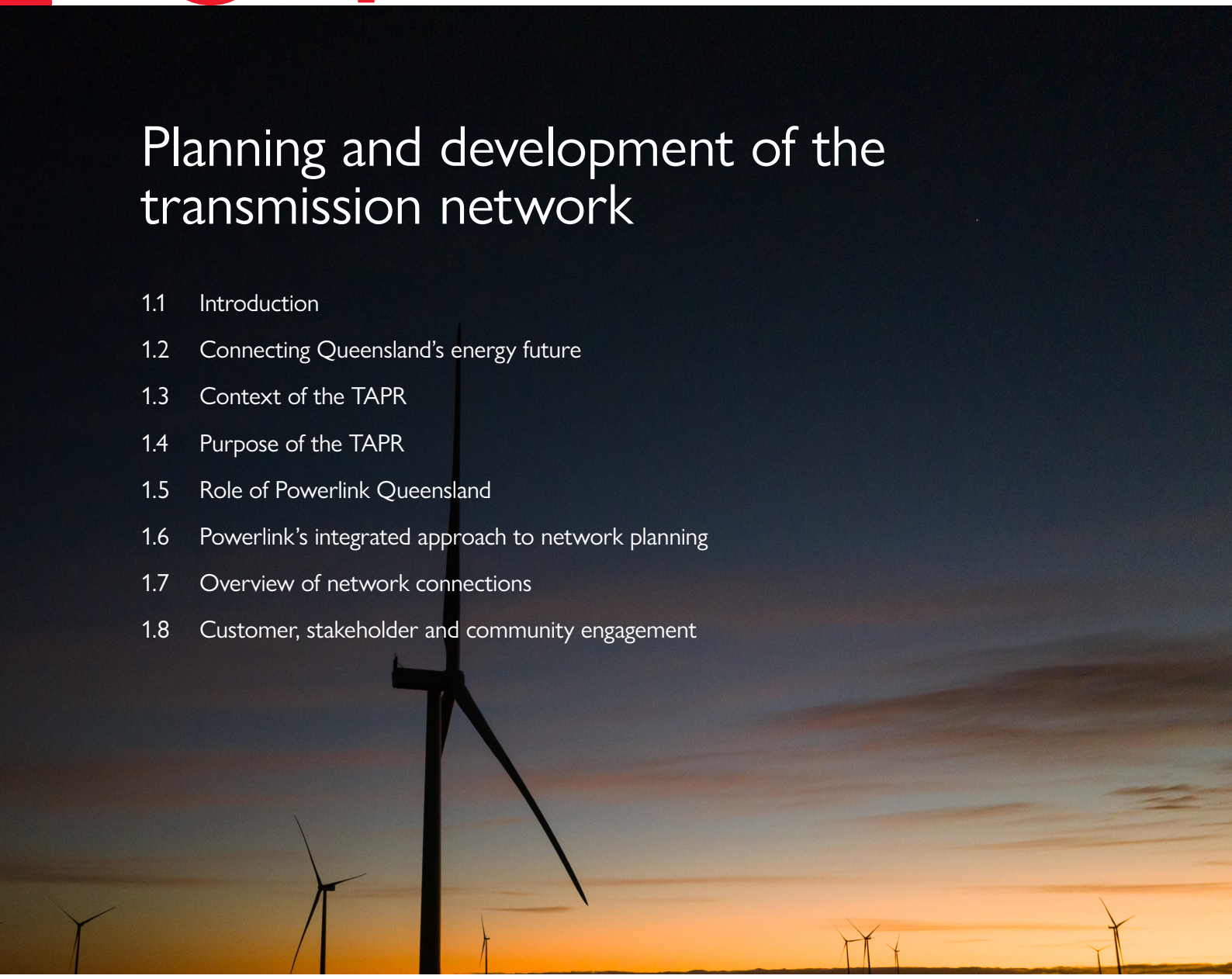
01

Planning and development of the transmission network



Powerlink Queensland's (Powerlink) annual planning review and Transmission Annual Planning Report (TAPR) play an important role helping to ensure the transmission network continues to meet the needs of Queensland customers and National Electricity Market (NEM) participants into the future. This chapter discusses Powerlink's planning obligations and role in supporting the energy transformation in Queensland, an update on the development of connection projects currently underway and Powerlink's most recent stakeholder engagement activities.

Key highlights

- The purpose of Powerlink's TAPR under the National Electricity Rules (NER) is to provide information about the Queensland transmission network, including key areas forecast to require expenditure in the 10-year outlook period.
- Powerlink is responsible for planning the shared transmission network within Queensland, including the development of new connections to the network.
- Since publication of the 2022 TAPR, Powerlink has proactively engaged with communities, customers and other stakeholders, seeking their input into Powerlink's network development, ongoing operations and new investment decisions.
- Local communities will be front and centre in Powerlink's planning and decision making as Powerlink continues to operate and maintain the existing network as well as planning and building the transformational network of the future.
- Given the ongoing scale and pace of the transformation of Queensland's power system, Powerlink is maintaining an integrated approach to future network planning to ensure the transmission network is developed in a safe, reliable, secure and cost effective manner.
- Powerlink has a central role in enabling the connection of variable renewable energy (VRE) in Queensland and continues to actively collaborate with solar and wind farm proponents as well as proponents, of Battery energy storage systems (BESS) that will provide firming services which will form an integral part of the future mix of technologies in Queensland.
- Powerlink is working closely with the Queensland Government on the establishment of Renewable Energy Zone (REZ) development areas and other major projects referenced in the Queensland Energy and Jobs Plan (QEJP).

1.1 Introduction

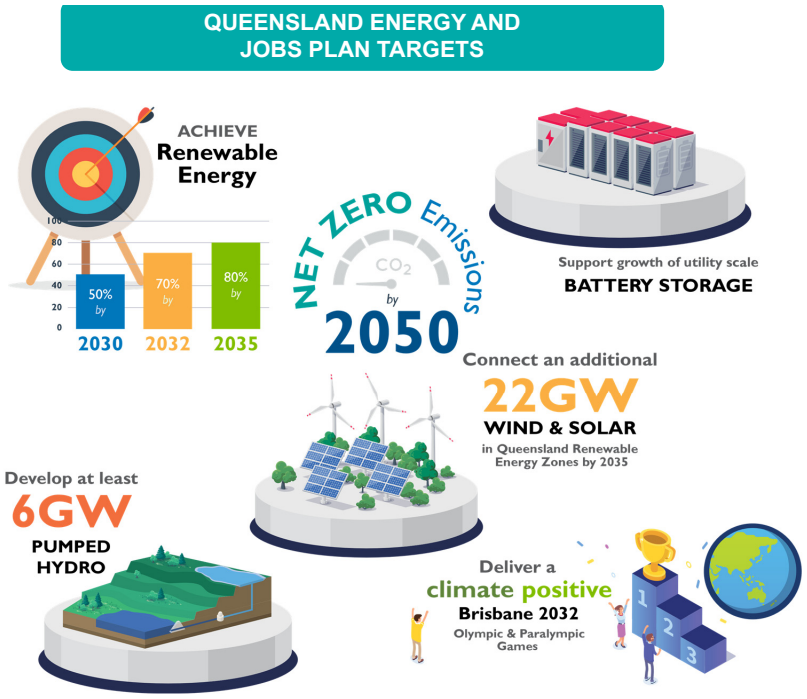
Powerlink Queensland is a Transmission Network Service Provider (TNSP) in the NEM and owns, develops, operates and maintains Queensland's high voltage (HV) transmission network. It has been appointed by the Queensland Government as the Jurisdictional Planning Body (JPB) responsible for transmission network planning within the State.

1.2 Connecting Queensland's energy future

The pace and scale of change in Australia's power system is one of the fastest in the world. Powerlink's transmission network plays a critical role in connecting Queenslanders to a world-class energy future and supporting key Government targets including new Renewable Energy Targets (RET) and achieving net zero emissions by 2050.

Powerlink is pursuing a least-cost power system transformation for customers and driving the coordinated and efficient development of REZs, while working positively with communities to achieve the objectives and goals set out in the QEJP (refer to Figure 1.1 and Chapter 2).

Figure 1.1 QEJP Targets



1.3 Context of the TAPR

As part of its planning responsibilities, Powerlink undertakes an annual planning review in accordance with the requirements of the NER[1] and publishes the findings of this review in its TAPR, and associated templates made available in the TAPR portal.

Information from this process is provided to AEMO to assist in the preparation of its Integrated System Plan (ISP). The ISP sets out a roadmap for the eastern and south-eastern seaboard's power system over the next two decades. It establishes a whole-of-system plan for an efficient transformation by identifying the optimal development path over this planning horizon for the strategic and long-term development of the NEM. The ISP identifies actionable and future projects requiring regulatory consultation, and informs market participants, investors, policy makers and customers about a range of potential future development opportunities.

The 2023 TAPR incorporates AEMO's demand and energy forecasts, consistent with those published for the 2023 Electricity Statement of Opportunities (ESOO). The ESOO examines electricity supply and demand issues across all regions in the NEM.

The primary purpose of the TAPR is to provide information on the short to medium-term planning activities of TNSPs, whereas the focus of the ISP is more strategic and longer term. Further, the ISP, System Strength, Inertia and Network Support and Control Ancillary Service (NSCAS) Reports and the TAPR are intended to complement each other in informing stakeholders and promoting efficient investment decisions. In supporting this complementary approach, the current published versions of these documents and reports are considered in this TAPR and more generally in Powerlink's planning activities.

Interested parties may benefit from reviewing Powerlink's 2023 TAPR in conjunction with AEMO's 2023 ESOO which was published in August 2023. The most recent ISP was released on 30 June 2022 and the 2022 System Strength, Inertia and NSCAS Reports were published on 1 December 2022.

1.4 Purpose of the TAPR

The purpose of Powerlink's TAPR under the NER is to provide information about the Queensland transmission network to those interested or involved in the NEM including AEMO, Registered Participants and interested parties. The TAPR also provides customers, stakeholders and communities with an overview of Powerlink's planning processes and decision making on future investment.

[1] For the purposes of Powerlink's 2023 TAPR, Version 201 of the NER in place from September 2023.

It aims to provide information that assists to:

- identify locations that would benefit from significant electricity supply capability or demand side management (DSM) initiatives
- identify locations where major industrial loads could be connected
- identify locations where capacity for new generation developments exist, in particular VRE generation and REZs
- understand how the electricity supply system affects customers, stakeholders and communities
- understand the transmission network's capability to transfer quantities of bulk electrical energy
- provide input into the future development of the transmission network.

Readers should note this document and supporting TAPR templates and TAPR portal are not intended to be relied upon explicitly for the evaluation of participants' investment decisions. Interested parties are encouraged to contact Powerlink directly for more detailed information[2].

1.5 Role of Powerlink Queensland

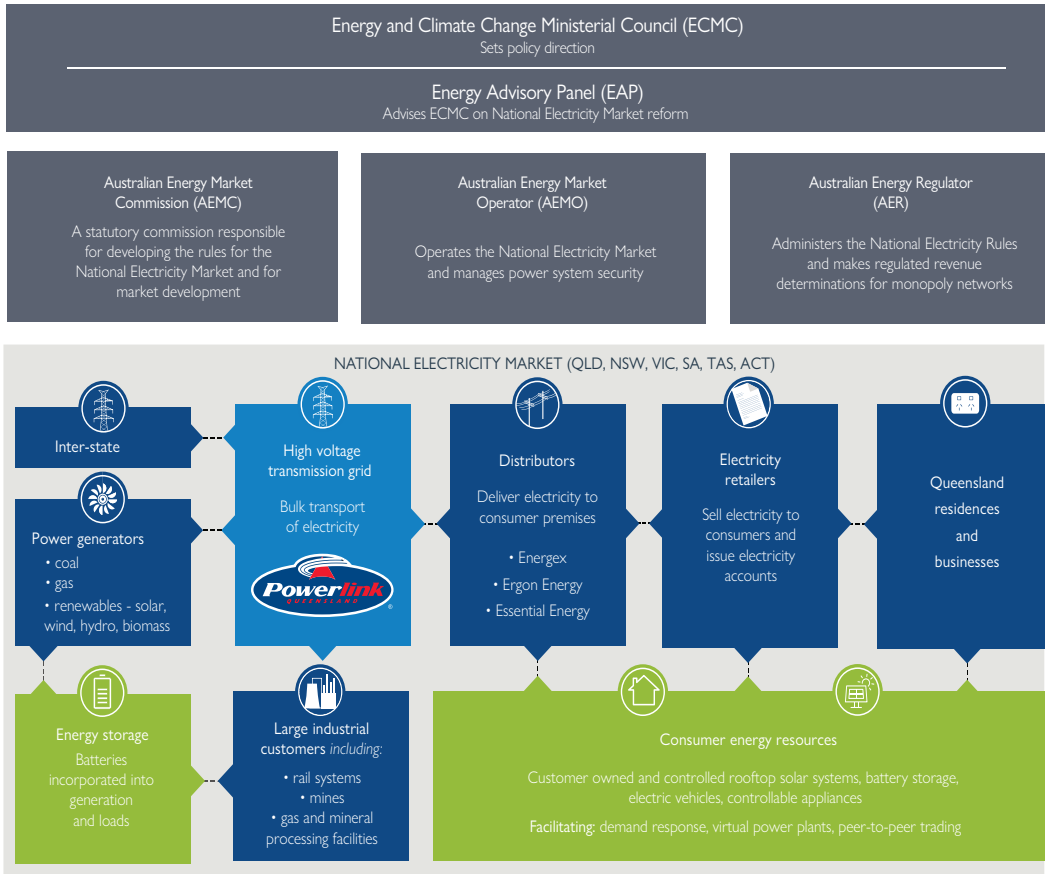
Powerlink's role in the Queensland power system is shown in Figure 1.2.

As the owner and operator of the transmission network in Queensland, Powerlink is registered with AEMO as a TNSP under the NER. In this role, and in the context of this TAPR, Powerlink's transmission network planning and development responsibilities include:

- ensuring the network is able to operate with sufficient capability and if necessary, is augmented to provide network services to customers in accordance with Powerlink's Transmission Authority and associated reliability standard
- ensuring the risks arising from the condition and performance of existing assets are appropriately managed
- ensuring the network complies with technical and reliability standards contained in the NER and jurisdictional instruments including the requirement to maintain minimum fault levels as prescribed by AEMO
- conducting annual planning reviews with Distribution Network Service Providers (DNSPs) and other TNSPs whose networks are connected to Powerlink's transmission network, that is Energex and Ergon Energy (part of the Energy Queensland Group), Essential Energy and Transgrid
- advising AEMO, Registered Participants and interested parties of asset reinvestment needs within the time required for action
- developing recommendations to address emerging network limitations or the need to address the risks arising from ageing network assets remaining in-service through joint planning with DNSPs and TNSPs, and consultation with AEMO, Registered Participants and interested parties, with potential solutions including network upgrades or non-network options such as local generation (including battery installation) and DSM initiatives
- examining options and developing recommendations to address transmission constraints and economic limitations across intra-regional grid sections and interconnectors through joint planning with other Network Service Providers (NSP), and consultation with AEMO, Registered Participants and interested parties
- assessing whether a proposed transmission network augmentation has a material impact on networks owned by other TNSPs, and in assessing this impact Powerlink must have regard to the objective set of criteria published by AEMO in accordance with Clause 5.21 of the NER
- undertaking the role of the proponent for regulated or funded[3] transmission augmentations and the replacement of transmission network assets in Queensland
- undertaking the role of System Strength and Inertia Service Provider in Queensland, providing the services required to meet system strength and inertia requirements.

[2] The information published within the 2023 TAPR is current as at 30 September 2023.
[3] Where applicable, in accordance with Clause 5.18 of the NER.

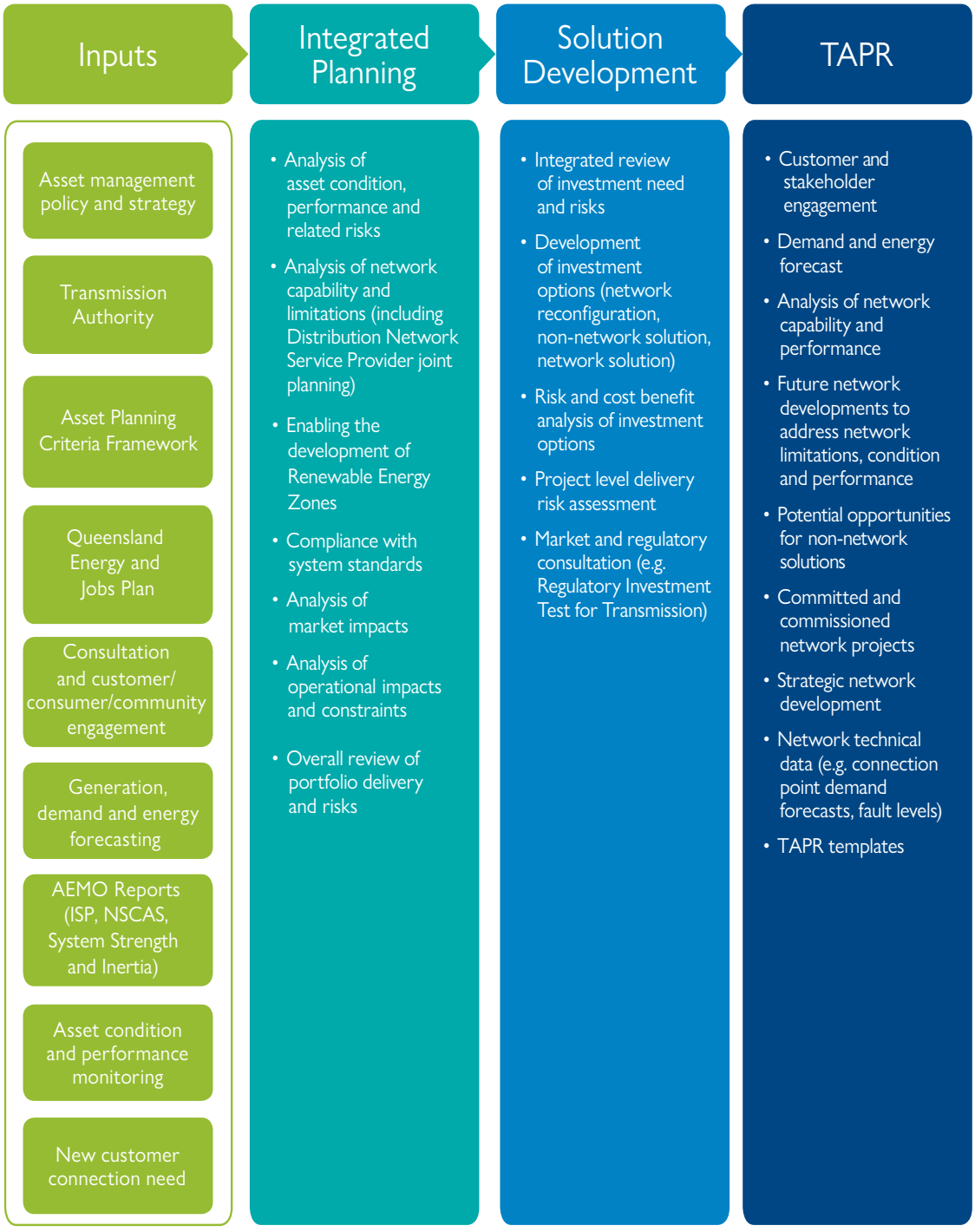
Figure 1.2 Powerlink's role in the Queensland power supply industry



1.6 Powerlink's integrated approach to network planning

An overview of Powerlink's integrated planning approach, taking into account the energy transformation, network capacity needs and end of technical service life related issues is presented in Figure 1.3.

Figure 1.3 Overview of Powerlink's TAPR planning process



Further information on Powerlink's planning responsibilities and processes as well as information on the principles and approach which guide Powerlink's analysis of future network investment needs and key investment drivers is available in Chapter 6 and Appendix A.

1.7 Overview of network connections

1.7.1 Summary of connection projects

Interest remains high from VRE generation and storage projects connecting in Queensland and Powerlink is progressing a significant number of connection applications which are well advanced (refer to Section 6.6.3). Table 1.1 provides an overview of the development of connection projects undertaken or being undertaken by Powerlink since 2018.

Table 1.1 Summary of connection projects

Solar/Wind Projects	2023 TAPR status	
Total completed to date	22	3,155MW
Under construction (1)	4	1,675MW
Existing and under construction	26	4,830MW
Connection Applications to date	56	14,543MW

Notes:

(1) Early works under construction at the time of 2023 TAPR publication.

(2) A 250MW committed pumped hydro storage project is underway at the time of 2023 TAPR publication.

(3) To date Powerlink has completed two storage projects, totalling 150MW and a further 500MW of storage projects are under construction.

1.7.2 Status of connection projects

To date Powerlink has completed connection of 24 (22 VRE + 2 BESS) large-scale solar, wind farm and BESS projects in Queensland, adding 3,305MW of generation capacity to the grid. A significant number of formal connection applications, totalling 14,543MW of new generation capacity, have been received and are at varying stages of progress.

During 2022/23, 399MW[4] of semi-scheduled VRE generation capacity has been committed in the Queensland region, taking the total VRE generation capacity to 5,334MW[5] that is connected, or committed to connect, to the Queensland transmission and distribution networks.

Approximately 1,494MW of embedded semi-scheduled renewable energy projects exist or are committed to Energy Queensland's network. In addition to the large-scale VRE generation development projects, rooftop photovoltaic (PV) in Queensland exceeded 5,500MW in July 2023.

Figure 1.4 shows the location and type of generators connected and committed to connect to Powerlink's network. The Department of Energy and Public Works (DEPW) also provides mapping information on proposed (future) VRE projects, together with existing generation facilities (and other information) on its website. For the latest information on proposed VRE projects and locations in Queensland, refer to the DEPW website.

[4] Comprised of Wambo Wind Farm (Powerlink) and Banksia and Gunsynd Solar Farms connected to the distribution network (Energy Queensland Group).

[5] Comprised of Powerlink and Energy Queensland Group committed and completed solar and wind projects. There are a number of projects under construction that have not yet reached committed status.

Figure 1.4 Under construction and existing connection projects since 2018

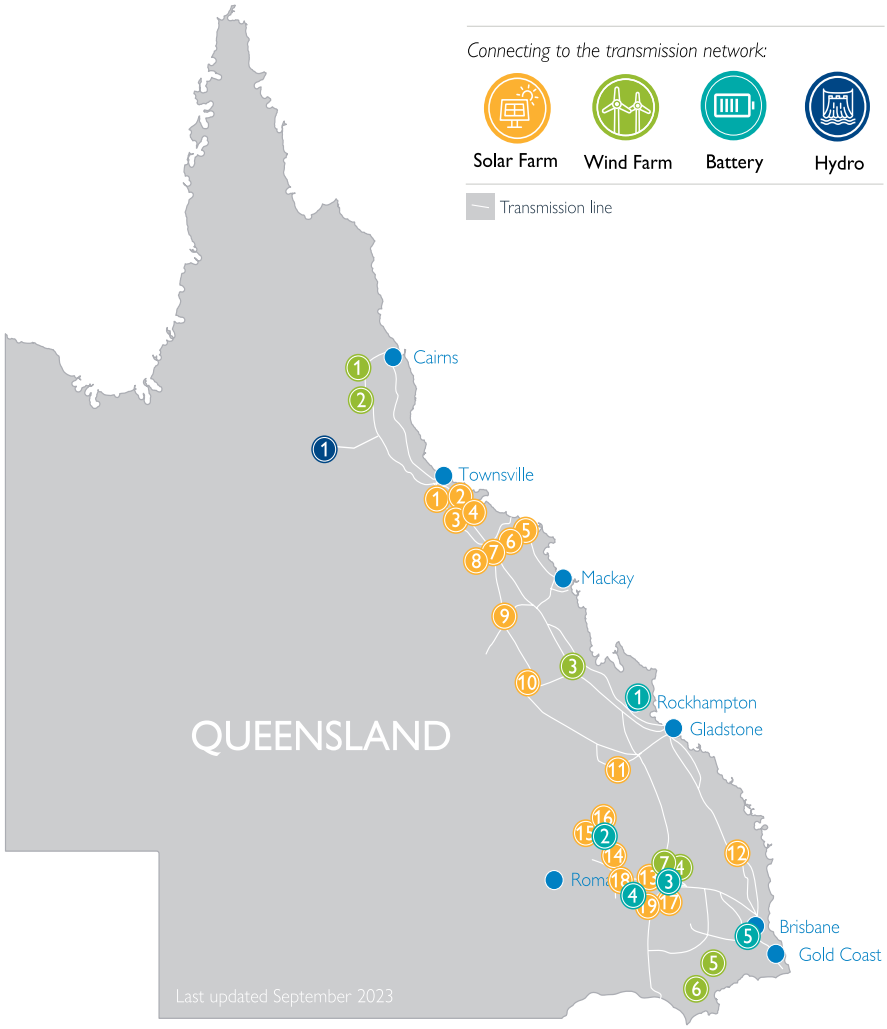


Table 1.2 Under construction and existing connection projects since 2018

Map ID	Generator	Location	Available capacity MW generated
Hydro-electric (1)			
1	Kidston Pumped Hydro Storage	Kidston	250
Solar PV (2)			
1	Ross River	Ross	116
2	Sun Metals	Townsville Zinc	121
3	Haughton	Haughton River	100
4	Clare	Clare South	100
5	Whitsunday	Strathmore	57
6	Hamilton	Strathmore	57
7	Daydream	Strathmore	150
8	Hayman	Strathmore	50
9	Rugby Run	Moranbah	65
10	Lilyvale	Lilyvale	100
11	Moura	Moura	82
12	Woolooga Energy Park	Woolooga	176
13	Blue grass	Chinchilla	148
14	Columboola	Columboola	162
15	Gangarri	Wandoan South	120
16	Wandoan	Wandoan South	125
17	Edenvale Solar Park	Orana	146
18	Western Downs Green Power Hub	Western Downs	400
19	Darling Downs	Braemar	108
Wind (2)			
1	Mt Emerald	Walkamin	180
2	Kaban	Tumoulin	152
3	Clarke Creek (3)	Broadsound	440
4	Coopers Gap	Coopers Gap	440
5	MacIntyre (3)	Tummaville	890
6	Karara (3)	Tummaville	100
7	Wambo (3)	Halys	245
Battery (2)			
1	Bouldercombe 2h BESS	Bouldercombe	50
2	Wandoan 1.5h BESS	Wandoan South	100
3	Chinchilla 2h BESS (3)	Western Downs	100
4	Western Downs 2h BESS (3)	Western Downs	200
5	Greenbank 2h BESS (3)	Greenbank	200

Notes:

(1) Shown at full capacity. However, output can be limited depending on water storage levels.

(2) VRE generators and batteries shown at maximum capacity at the point of connection. The capacities are nominal as the generator rating depends on ambient conditions.

(3) Generators undergoing construction are shown at future maximum expected capacity at the point of connection. Actual available generating capacity will vary over the course of the commissioning program.

1.7.3 The connections process

Participants wishing to connect to the Queensland transmission network include new and existing generators, storage, major loads and other NSPs. New connections or alterations to existing connections involves consultation in accordance with the NER Chapter 5 connection process between Powerlink and the connecting party to negotiate an Offer to Connect and Connection and Access Agreement (CAA). Negotiation of the CAA requires the specification and then compliance by the generator or load to the required technical standards. The process of agreeing to technical standards also involves AEMO. The services provided can be prescribed for DNSPs (regulated), negotiated or non-regulated services in accordance with the definitions in the NER or the framework for provision of such services.

From July 2018 new categories of connection assets were defined, namely Identified User Shared Assets (IUSA) and Dedicated Connection Assets (DCA). All new DCA services, including design, construction, ownership and operation and maintenance are non-regulated services. IUSA assets with capital costs less than $10 million are negotiated services that can only be provided by Powerlink. IUSA assets with capital costs above $10 million are non-regulated services. Powerlink remains accountable for operation of all IUSAs and any above $10 million must enter into a Network Operating Agreement to provide operations and maintenance services.

From July 2021 Large Dedicated Connection Assets were replaced with Designated Network Assets (DNA). A DNA is a radial transmission extension greater than 30km in length. DCAs remain for connections less than 30km. A DNA is not a connection asset, but rather a transmission network. It differs to the shared transmission network as the design, construction and ownership of the DNA are non-regulated services. As for IUSAs, Powerlink remains accountable for operation and maintenance of all DNAs. A special access framework for DNAs is set out in the NER Chapter 5.

As DNAs will form part of the transmission network operated by a TNSP, the point where an individual proponent connects to a DNA will be a transmission network connection point. This allows for the application of existing arrangements for settlement, metering, calculation of loss factors, transmission use of system charges, system strength and performance standards, with only minor modifications.

Powerlink will continue to work with market participants and interested parties across the renewables sector to better understand the potential for VRE generation, and to identify opportunities and emerging limitations as they occur. The NER (Clause 5.3) prescribes procedures and processes that NSPs must apply when dealing with connection enquiries.

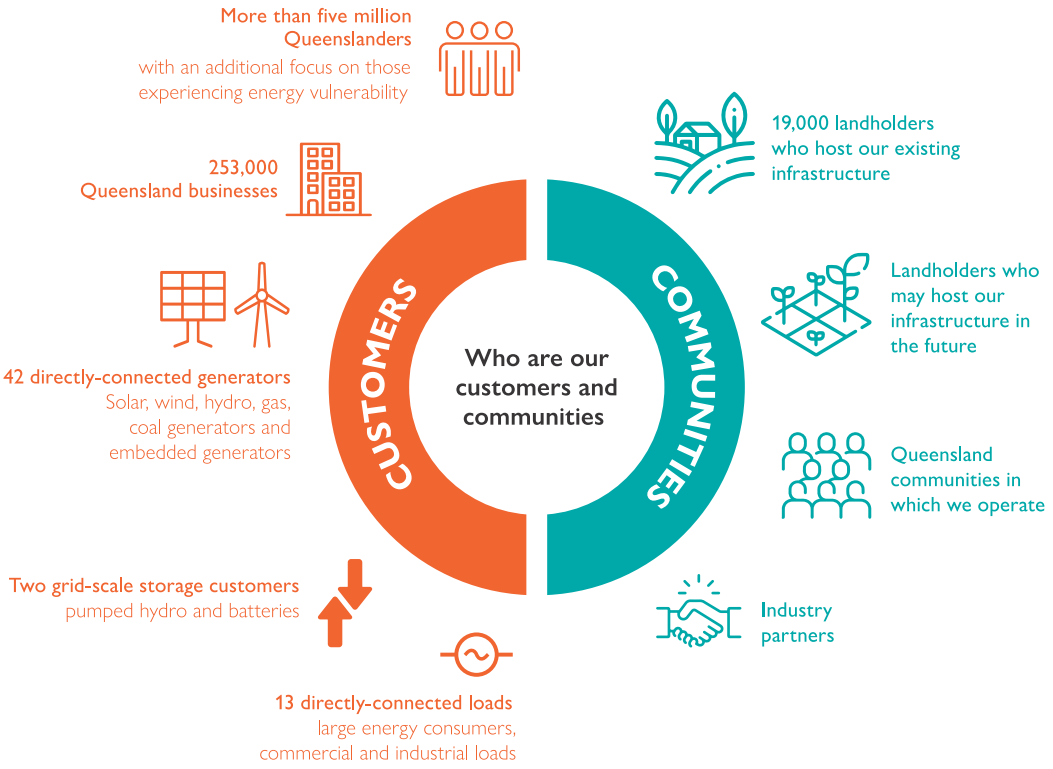
Figure 1.5 Overview of Powerlink's existing network connection process

Proponents who wish to connect to Powerlink's transmission network are encouraged to contact BusinessDevelopment@powerlink.com.au. For further information on Powerlink's network connection process please refer to Powerlink's website.

1.8 Customer, stakeholder and community engagement

Powerlink shares targeted, timely and transparent information with its customers, communities, First Nations Peoples and other stakeholders using a range of engagement approaches. Powerlink customers include more than five million Queenslanders and 253,000 businesses who receive electricity through the energy network. Directly-connected customers include Queensland's generators and storage proponents and large industrial energy users (refer to Figure 1.6).

Figure 1.6 Powerlink's customers and communities



There are also stakeholders who provide Powerlink with non-network solutions that can either connect directly to Powerlink's transmission network, or to the distribution network (refer to Chapter 5).

The TAPR is an important tool Powerlink uses to communicate information about transmission planning in the NEM. Through the TAPR, Powerlink aims to increase stakeholder and customer, stakeholder and community understanding and awareness of key updates and external shifts, including load forecasting, transmission network planning and the energy transformation.

1.8.1 2022/23 engagement activities

All engagement activities are undertaken in accordance with our Stakeholder Engagement Framework and Community Engagement Strategy, which set out the principles, objectives and outcomes Powerlink seeks to achieve in its interactions with stakeholders and the broader communities in which Powerlink operates. A number of key performance indicators are used to monitor progress towards achieving Powerlink's stakeholder engagement performance goals. In particular, Powerlink undertakes a comprehensive biennial stakeholder survey to gain insights about stakeholder perceptions of Powerlink, its social licence to operate and reputation. Most recently completed in November 2022, it provides comparisons between baseline research undertaken in 2012 and year-on-year trends to inform engagement strategies with individual stakeholders. More detailed information on Powerlink's engagement activities is available on the Powerlink website.

Engagement activities Powerlink has undertaken since the publication of the 2022 TAPR are outlined in the remainder of this section.

2022/23 Community engagement

Engaging with communities is essential to providing transmission services that are safe, reliable and cost effective. Transmission infrastructure stays in-service for up to 50 years and Powerlink is focussed on building positive relationships and partnering with local communities to deliver benefits for the longer term. In 2021, a new Community Engagement Strategy was developed and implemented to support delivery of the energy transformation and ensure Powerlink was focussed on driving mutually beneficial outcomes for impacted communities.

Powerlink also undertook targeted community engagement research across the state to gauge community acceptability of renewable development and related transmission infrastructure. The research findings support Powerlink's engagement going forward and ensures a focus on key factors that are important to communities. Powerlink is looking to undertake another round of community sentiment research in late 2023. As Powerlink continues to operate and maintain the existing network through to embarking on planning and building the transformational network of the future, local communities will be front and centre in our planning and decision making.

In 2022, work continued to embed the Community Engagement Strategy to further guide engagement activities across the state and set expectations for how Powerlink wants to proactively engage to drive a positive social licence to operate in key communities. The strategy is driving the business focus on engaging early and often, particularly with communities where Powerlink is building new infrastructure and connecting renewable development projects. This early engagement approach includes seeking feedback and input earlier in the project development process and incorporating these insights into Powerlink's planning and decision making.

In addition, Powerlink played a key role in the development of the Energy Charter Better Practice Social Licence Guideline released in May 2023. This work was completed within an Energy Charter #BetterTogether collaborative innovation project. The guideline focusses on identifying impacts and opportunities for the communities affected by the energy transformation.

2022 Transmission Network Forum

In November 2022, more than 450 customers attended (in person and virtually) Powerlink's annual Transmission Network Forum. The forum provided updates on the state of the network, an industry panel discussion, an interactive workshop to explore and investigate Powerlink's response to the QEJP and a technical session on the 2022 TAPR. The live stream recordings, presentations and questions raised and answers discussed are available on Powerlink's website.

Review of Network Development Process

Since publication of the 2022 TAPR, Powerlink has undertaken a review of the process formerly called the Network Development Process used to secure new easements as part of its project delivery. A Stakeholder Reference Group was established to provide input into the review, including the Queensland Farmers' Federation, Local Government Association of Queensland, RE-Alliance and Energy Users Association of Australia.

Over nine months, the reference group focussed on key areas to improve the process including engagement, land access and landholder payments. The review changed the focus of the process from formal planning approval milestones to engagement opportunities for landholders and the wider community. The process has been renamed to the Transmission Easement Engagement Process to reflect this change.

As part of this review, Powerlink also launched a new SuperGrid Landholder Payment Framework that significantly boosts payments to landholders hosting new transmission infrastructure. The increase in payments is based on property-specific values and impacts, as opposed to a flat rate used previously. Powerlink will become the first transmission company in Australia to offer payments to landholders on neighbouring properties adjacent to transmission infrastructure.

Customer Panel

Powerlink hosts a Customer Panel that provides an interactive forum for its stakeholders and customers to give input and feedback to Powerlink regarding decision making, processes and methodologies. Comprised of members from a range of sectors including industry associations, resources, community advocacy groups, directly connected customers and distribution representatives, the panel provides an important avenue to keep Powerlink's stakeholders better informed about operational and strategic topics of relevance. The panel met in February, March, June and September 2023. Key topics for discussion included Powerlink's activities relating to the QEJP, changing network operating conditions and Powerlink's customer focus maturity and priorities under The Energy Charter.

Asset Reinvestment Review Working Group

In 2022 Powerlink established an Asset Reinvestment Review (ARR) Working Group, made up of representatives from the Australian Energy Regulator (AER), key customer advocates and members of Powerlink's Customer Panel, to shape and participate in a review of its asset reinvestment approach. A co-designed scope for the review was developed with the ARR Working Group to guide discussions. The scope includes both the prudency and efficiency elements of reinvestment capital expenditure, with a focus on Powerlink's approach to transmission line refit projects. The first of the review deliverables, an ARR Working Group Report, was published in May 2023 (refer to Section 6.3.4).

Stakeholder engagement for regulatory processes

Powerlink recognises the importance of transparency for stakeholders and customers, particularly when undertaking transmission network planning and engaging in public consultation processes, such as the Regulatory Investment Test for Transmission (RIT-T), an Expression of Interest or Funded Augmentation.

Powerlink is committed to a balanced approach in public consultation processes as determined with its Customer Panel. In addition, Powerlink is guided by the AER Stakeholder Engagement Framework and Consumer Engagement Guideline for Network Service Providers as the benchmarks when undertaking public consultations.

The most frequent public consultation process undertaken by Powerlink is the RIT-T and further information on the proposed engagement activities for RIT-Ts can be found on Powerlink's website.