



Paper information

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Summary

Australia is no different to the rest of the world and is experiencing an accelerated uptake of renewable generation, driven by industry and government decarbonisation and net zero emission imperatives. The Queensland Government's "Queensland Energy and Jobs Plan" (QEJP) was released in September 2022 and outlines a plan to decarbonise the existing electricity network by utilising network, renewable generation, pumped hydro storages and a range of other elements. It outlines a Queensland state renewable energy target (QRET) of 70% renewable generation by 2032 and 80% by 2035, which equates to an additional 22GW of renewable generation by 2035. The Queensland Government also released the 2023 Queensland Renewable Energy Zone Roadmap in July 2023, which details the renewable energy zones proposed in various parts of Queensland.

The QEJP outlines a role for Powerlink to be the REZ Delivery Body (RDB) to develop detailed Renewable Energy Zone Management Plans to ensure that the timing of renewable development aligns with other key infrastructure development activities. This framework allows the RDB to bypass elements of the existing regulatory frameworks to simplify renewable connections. Further, the framework endorses a market-led, generator-pays REZ model that promotes the appropriate allocation of risk and costs and is delivered through non-regulated funds to the greatest extent possible.

This paper provides an overview of the role of the REZ Delivery Body and a Queensland-centric approach to REZ development. It highlights the key principles and strategic criteria that will promote ease and speed to market while reducing the cost of connection.

Keywords

Renewable Energy Zones, REZ Delivery Body

Developing Queensland Renewable Energy Zones and the REZ Delivery Body Function

Introduction

The transformation of the energy system within Queensland from synchronous fossil fuel generation to one underpinned by clean, sustainable and affordable renewable energy is well underway. The share of large-scale Variable Renewable Energy (VRE) within the State continues to increase with significant growth in grid-connected solar and wind farms. The uptake of rooftop PV systems continues to be strong with Queensland leading Australia with the highest percentage of dwellings with a roof-top PV system at almost 44%. A number of corporations have committed to the decarbonisation of existing fossil-fuelled operations and processes through either electrification or clean fuel substitution. Additionally, a new industry based on hydrogen is also emerging.

Powerlink Queensland (Powerlink) is a Government Owned Corporation (GOC) Transmission Network Service Provider (TNSP) that builds, owns, operates and maintains the high voltage electricity transmission network that stretches 1700 kilometres from north of Cairns to the New South Wales border. Powerlink’s transmission system is central to the efficient transformation to a lower carbon future. The energy system of the future will look considerably different with large-scale VRE generation, battery energy storage systems, large-scale Pumped Hydro Energy Storage (PHES), decarbonised industrial loads, emerging green hydrogen markets, electric transportation and orchestrated distributed consumer energy resources. Figure 1 provides a visual representation of this transformation [1].

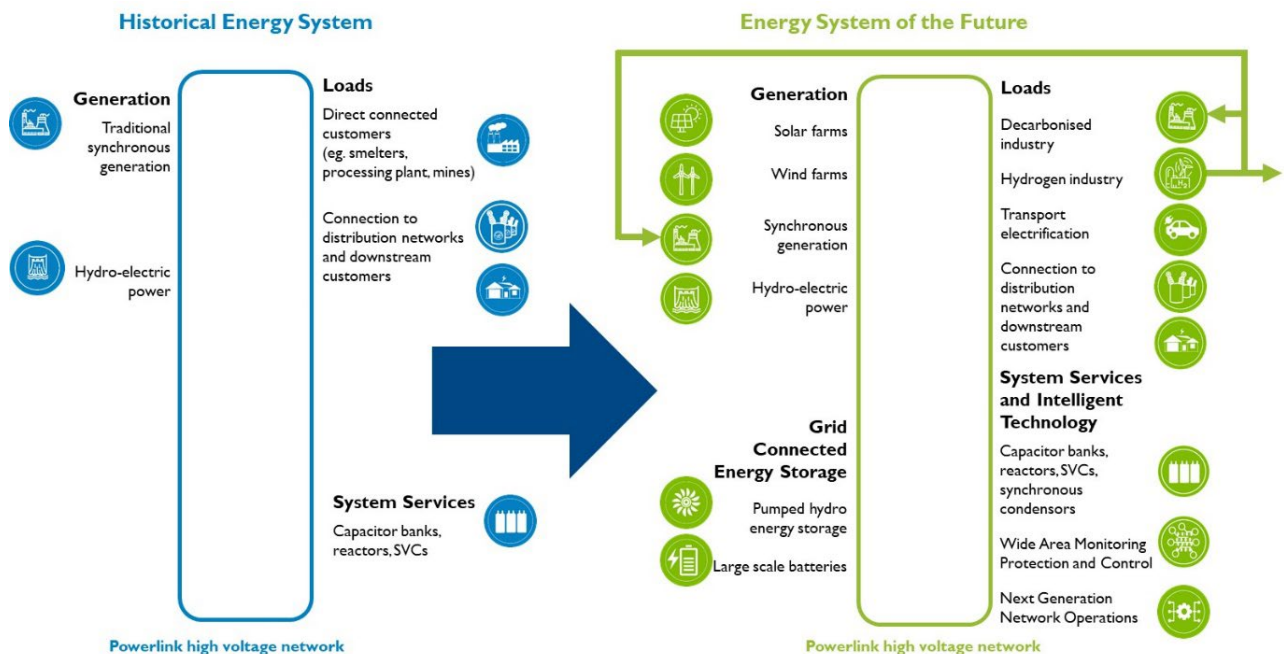


Figure 1 Energy system of the future

The QEJP

In September 2022, the Queensland Government released the Queensland Energy and Jobs Plan (QEJP) and the Queensland SuperGrid Infrastructure Blueprint (Blueprint).

Powerlink has been working closely with the Queensland Government, providing technical expertise and guidance on transmission-related topics, renewables and the scope of PHES projects.

To achieve a target of 70% renewable generation by 2032 and 80% by 2035, the Blueprint and the REZ Roadmap include a number of interdependent elements spanning generation, firming and transmission.

An additional 22 gigawatts (GW) of new wind and solar generation will be developed and connected by 2035. This will be supported by a portfolio of firming resources that includes at least 6GW of long-duration PHES, batteries, neighbourhood and household customer energy resources, and low to zero emissions gas generation.

Transmission capacity is the other important interdependent element. As such, Powerlink will play an integral role in upgrading the transmission backbone network in four stages over the next 10-15 years to transport large volumes of renewable and stored energy.

Together, these elements will enable the rapid decarbonisation of the electricity sector as well as parts of the broader economy through electrification. It also sets the platform to pursue future opportunities, such as the establishment of hydrogen plants.

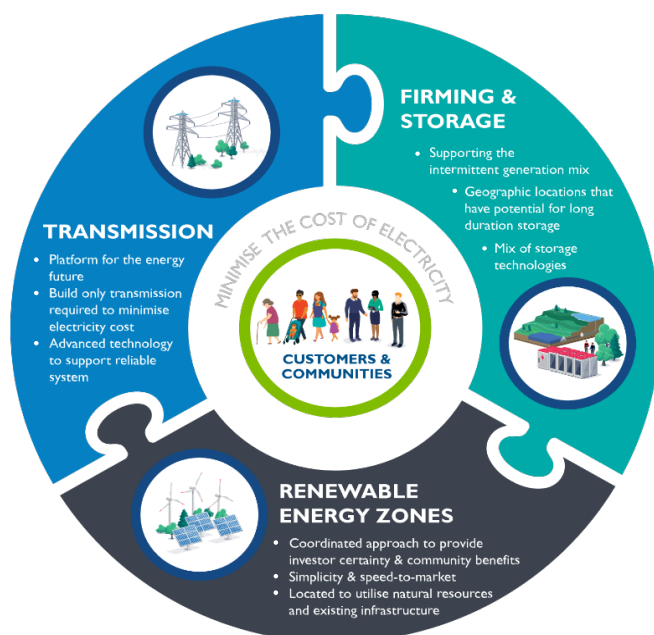


Figure 2 The interdependent Energy system of the future

Powerlink understands it is critical that all three of these elements are delivered – no one element on its own will successfully move us to a decarbonised economy.

Powerlink's focus is on continuing to work closely with community and industry on:

- supporting connection of new generation at locations with high resource quality relatively close to the transmission network
- developing REZs in a scale-efficient way to maximise hosting capacity and system strength at lowest cost
- utilising existing network capacity

- optimising the network design and project delivery timeframes around the proposed PHES facilities, new REZ developments, repurposing of existing coal generation and planning for expansion of the network for longer-term load developments
- adopting contemporary and emerging technologies to limit the initial scale of network investment required, minimising costs to customers, while delivering the required reliability.

Developing renewable energy zones (REZs) in Queensland

A Coordinated Approach to Renewable Energy Development and Connection

The Blueprint modelling indicates that 25GW of large-scale renewable generation will be needed by 2035, of which around 3GW exists today.

Looking beyond 2035, it is likely that Queensland will need even more renewable generation, considering the additional electricity demand created by new industries such as hydrogen and electrification of existing sectors such as mineral processing and transport. The Australian Energy Market Operator's (AEMO) 2022 Integrated System Plan (ISP) Step Change scenario forecasts Queensland will require 48GW of renewable generation by 2050.

To enable this amount of new generation will require a new coordinated approach to achieve renewable energy targets at the least overall cost to customers. REZs will provide this coordination.

What Is a REZ?

A REZ is a geographic area with high-quality renewable resources like wind and solar, suitable topography and land availability to support the connection of renewable generators, and potential for coordinated development as shown in Figure 3.

REZs enable the cost-effective development of a coordinated, large-scale approach to connecting multiple renewable energy developments to the transmission network.

The REZ concept allows Powerlink to optimise how and where renewable energy is connected and integrated within the existing power system to achieve renewable energy targets at least overall cost to customers. The REZ design also promotes cost-effective connections for generation customers and optimised provision of system services. Importantly, the REZ concept provides an opportunity to deliver benefits to communities and landholders within the REZ.

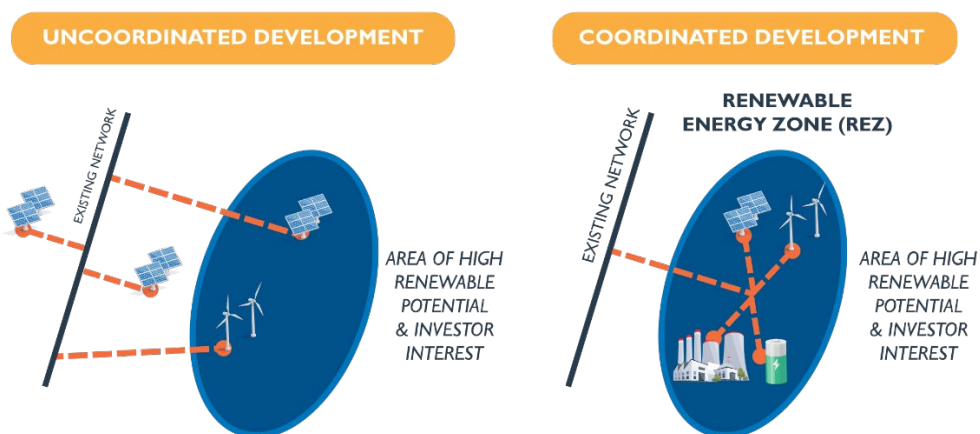


Figure 3 Uncoordinated vs coordinated approach to renewable developments

Enabling REZ Developments In Queensland

Powerlink has a strong history of connecting renewable generation projects to its network. In the last six years, 21 large-scale wind and solar generation projects with a combined maximum output of about 3,030MW has been connected. See Figure 4 below.

Powerlink currently has five renewable connection projects under construction and commissioning, with a combined maximum output of 2,090MW. As at September 2022, 32 renewable applications are being processed representing approximately 11GW of generation. In total, more than 30GW of renewable generation projects are in the initial project development stage.

Powerlink has already enabled the establishment of REZs across Queensland, underpinned by an approach that delivers benefits to generators, customers and communities. Powerlink is unlocking approximately 7.5GW of hosting capacity through current projects.

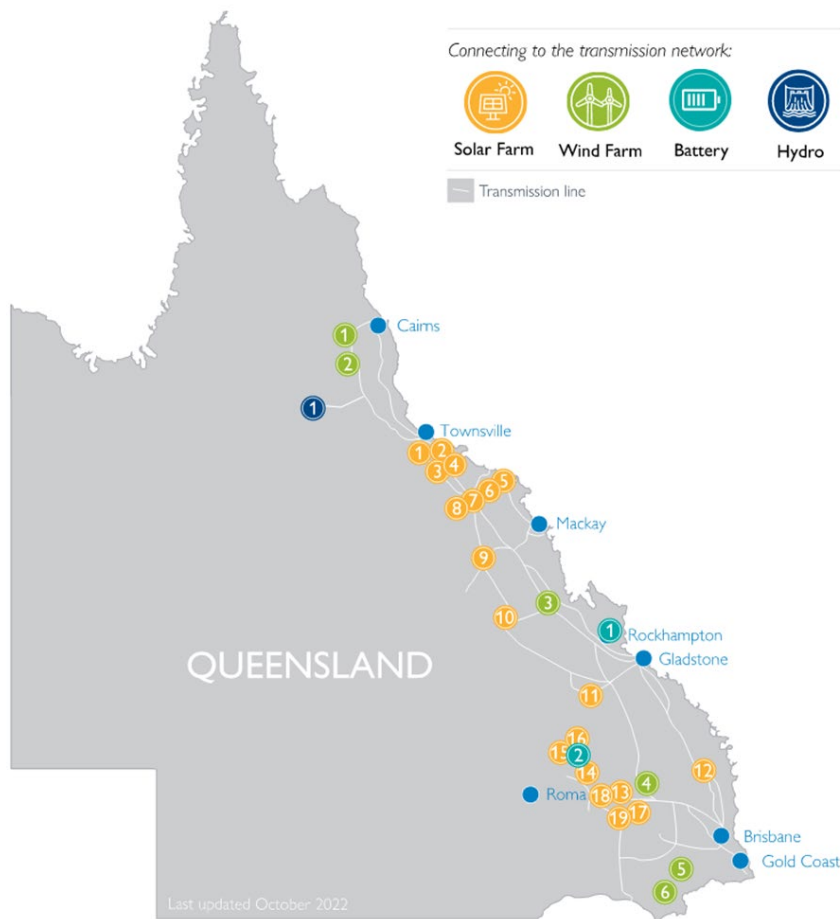


Figure 4 Existing and under construction connection projects since 2018

REZ ROADMAP

The Queensland Government published the Queensland Renewable Energy Zone Roadmap in July 2023 [2], which outlines the pathway for connecting an additional 22GW of new wind and solar generation to support the objectives of the QEJP. Across the state, there are 12 potential REZs to be developed across three phases to 2035. The location and size of the REZs depicted in the Roadmap was provided by Powerlink and is shown in Figure 5 below.

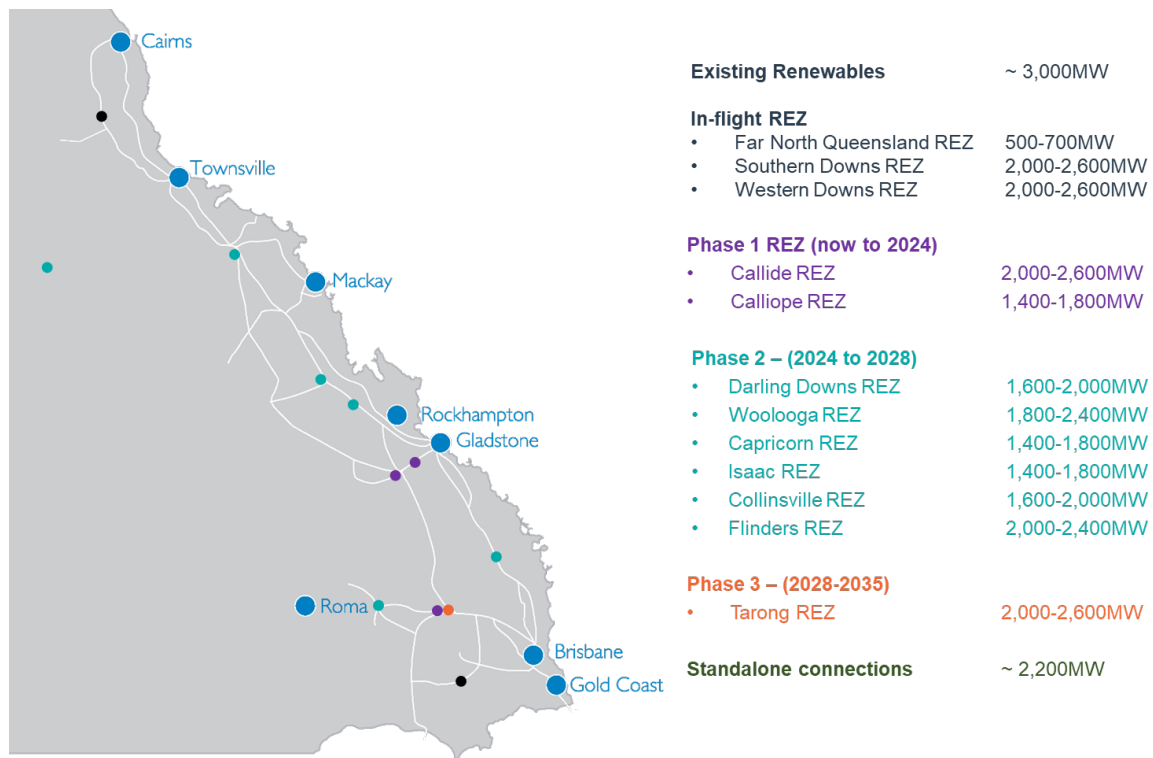


Figure 5 Queensland REZ Roadmap to deliver additional 22GW of renewable generation

REZ BENEFITS

As the energy system transforms, Powerlink is committed to implementing a market-led, generator-pays REZ model which promotes the appropriate allocation of risk and costs, and is delivered through non-regulated funds to the greatest extent possible. This REZ approach delivers benefits to generators, customers and communities.

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| Developers | <p>The REZ approach delivers benefits by unlocking opportunities for generators to connect to the network, increasing the cost-effectiveness of connecting and optimising the capability of the system. Key principles are:</p> <ul style="list-style-type: none"> • simplicity and transparency in the connection process • reduced individual proponent connection costs • clear and consistent community engagement requirements • aggregated Generator Performance Standards (GPS) methodology • speed and ease of connections. |
| Communities | <p>Communities and landholders can benefit from a coordinated REZ approach, including:</p> <ul style="list-style-type: none"> • supporting local communities to deal with renewable developments in a coordinated way • community investment funding can be pooled and scaled proportionately • coordinated local procurement, training and employment opportunities • improved engagement with a coordinated approach to sharing information and input about the proposed REZ development. |

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| End-use Customers | <p>The approach considers benefits for the end-use customer:</p> <ul style="list-style-type: none"> • by implementing a market-led, generator-pays REZ model • by coordinating development in areas of high renewable potential, we can support cost-effective, scale-efficient renewable energy projects that provide energy at low prices per megawatt hour (MWh). |
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REZ Principles and Strategic Criteria

Powerlink has developed a number of key principles and strategic criteria to support the establishment of the REZs. These are outlined in Figure 6 and discussed further below.



Figure 6 REZ Principles and Criteria

Key principles for REZ development:

1. REZs are developed with a clear focus on customers and downward pressure on electricity prices.
2. Ensure that each REZ architecture is designed to provide low-cost, scale-efficient infrastructure.
3. Communities are essential to the success of REZs and are engaged along the way.
4. Queensland has limited wind resources and requires careful consideration to fully utilise this diverse resource.

Strategic criteria for REZ development:

1. Staging of generation
 - Wind generation development is the initial focus of REZ developments, with a shift in focus towards solar generation, when large-scale energy storage systems are available.
 - Locate REZs near loads to reduce the need for major augmentation of the transmission network and reduce transmission losses.
 - Locate REZs to replace existing thermal generation to take advantage of existing transmission capacity.

- Locate REZ near pumped hydro energy storage to minimise the need to augment the transmission network and minimise transmission losses, as pumped hydro will become a major load centre.
2. Known investor interest
Developing a REZ in an area with known interest from renewable proponents ensures the likelihood of subscribing the REZ.
 3. Focus on areas where transmission is strong
Powerlink aims to exploit the low hanging fruit first by focusing on areas where the transmission is strong. This will reduce the potential impacts of network constraints and improve outcomes for renewable generators. In time, as the 500kV network is developed, selected parts of the underlying 275kV network may be considered as REZ network as well.
 4. Balanced with other considerations
All these need to be balanced by community, land-use, environmental and other considerations. We will engage early with communities so their interests are considered and balanced in REZ development.

Proposed Role as REZ Delivery Body

Feedback from industry bodies such as the Clean Energy Council (CEC) has indicated significant transmission investment and grid connection challenges that impact the commissioning of existing and development of new renewable projects. Other Australian states, including New South Wales and Victoria have moved to bypass the existing regulatory frameworks to improve the speed of renewable connections.

New Queensland laws are being developed to establish the framework for declaring and developing the REZs. The Energy (Renewable Transformation and Jobs) Bill 2023 [3] outlined the process for QREZ development and associated legislative changes. Under this process, it is proposed that Powerlink will be the REZ Delivery Body (RDB¹). This future legislation change will allow the RDB to bypass elements of the existing regulatory frameworks to simplify renewable connections.

The overarching purpose of the RDB is to oversee, on behalf of the Queensland Government, a coordinated and transparent approach to planning and delivering Renewable Energy Zones. The RDB will broadly be responsible for planning and recommending REZ development areas for declaration, provide oversight on community and market engagement, and generally ensure the development of REZs are aligned to meet renewable energy targets.

More specifically, the RDB provides transmission services for the purposes of developing a REZ including the following:

- Planning the sequence and timing for various REZs to be connected to the shared transmission system taking into account factors including shared transmission network capacity and development plans, renewable energy development targets, known market interest, social licence, availability of renewable resources.
- Preparation of a REZ Management Plan (RMP) for each proposed REZ that describes various elements of the REZ including the basis and rationale for the REZ, location, details of the REZ.

¹ The original paper proposed the creation of the Designated Planning Body (DPB). This has subsequently been changed to REZ Delivery Body (RDB)

- Obtaining formal approval of each proposed RMP through Government and thus allowing the Queensland Minister for Energy to declare the REZ from which point the QREZ framework will be applied to the nominated area and infrastructure.
- Oversighting community consultation in relation to each proposed RMP.
- Oversight the REZ Development and reporting.

This simplification of process will enable Powerlink to more readily connect renewable generation to the transmission network and thus meet renewable energy targets. Powerlink anticipate the first two REZ declarations in 2024 and an additional one to two per year thereafter.

Bibliography

- [1] Powerlink Transmission Annual Planning Report, 2022
- [2] Queensland Department of Energy and Public Works, 2023 Queensland Renewable Energy Zone Roadmap, July 2023
- [3] Queensland Department of Energy and Public Works, Energy (Renewable Transformation and Jobs) Bill, June 2023