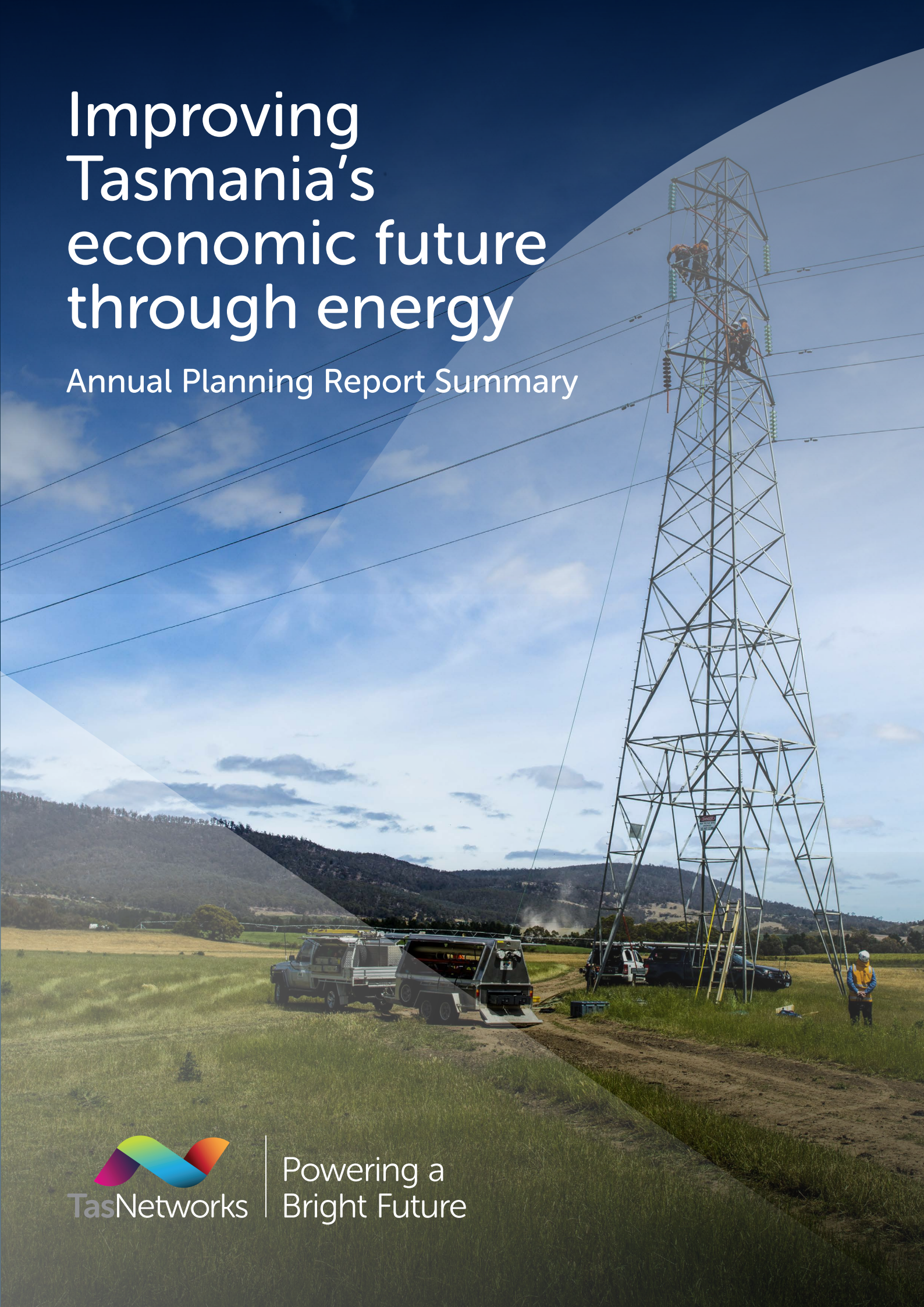
Improving Tasmania's economic future through energy

Annual Planning Report Summary



TasNetworks | Powering a Bright Future

Introduction

As both the transmission and distribution network service provider in Tasmania, TasNetworks is uniquely positioned amongst Australia's electricity networks to optimise our development plans across the two functions.

By producing a combined transmission and distribution Annual Planning Report (**APR**), we can plan for the future of both networks in a way that minimises costs for all customers.

The key elements of our future plans are:

- developing the transmission network in the State's North West to support the proposed Marinus Link undersea interconnector with Victoria, as well as new wind generation in the North West Tasmania Renewable Energy Zone;
- augmentation of the Palmerston to Sheffield 220 kV transmission corridor, which is required under the majority of future scenarios;
- addressing system strength and inertia requirements as increasing amounts of inverter-based generation (such as wind farms), are connected to the Tasmanian power system;
- supporting the development of Renewable Energy Zones (**REZs**) in the Central Highlands and North East Tasmania;
- preparing the distribution network for bidirectional flows to facilitate customer energy usage aspirations; and
- supporting the proposed hydrogen production facilities in the Bell Bay Advanced Manufacturing Zone, as required.

TasNetworks welcomes feedback and enquiries on any of the matters raised in this document, our APR, Future Distribution System Vision and Roadmap or our EV Strategy.

Please send feedback and enquires to: planning.enquiries@tasnetworks.com.au

Together with the APR, TasNetworks will also publish a Future Distribution System Vision and Roadmap which details our plan for Tasmania's distribution network, developed in response to the evolving needs of our customers, emerging community expectations and accelerating technological advances. A major focus of that Roadmap is facilitating customer adoption of distributed energy resources (**DER**). We have also developed an Electric Vehicle Strategy, to help prepare the network for the increasing uptake of electric vehicles (**EVs**) and make it easier for customers to charge them.

Over the next two decades, TasNetworks is tasked with managing a significant step change in the generation and transmission of electricity across Tasmania, and into the mainland. This document summarises the key assumptions and thinking which underpins our proposed approach to this, as further detailed in our 2021 APR.

Tasmanian renewable energy transformation

In 2020, Tasmania became self-sufficient from an energy perspective, meeting its own electricity requirements from the state's world-class wind and hydro-electric generators. Over the next 20 years, the State is set to enhance its renewable energy capabilities, grow its role as a supplier of zero emission energy to mainland Australia and facilitate production of green hydrogen, for both domestic and international markets.

Under the Government's Tasmanian Renewable Energy Target (**TRET**), the State's renewable energy output is destined to double, so that by 2040 Tasmania will produce twice as much clean power as it does now.

Realising such an ambitious target will require 2,500–3,000 MW of new generation. Pumped hydro storage developments are part of Hydro Tasmania's Battery of the Nation plans, along with upgrades to a number of existing hydro-electric power stations that will lift their output. What's more, with up to 1,000 MW of proposed new load associated with hydrogen production, and the additional energy to be transferred between Tasmania and the Australian Mainland through Marinus Link, the amount of energy conveyed by the Tasmanian electricity network could potentially double by 2040. These factors, in addition to the fact that the maximum demand of Tasmania is also forecast to increase significantly, (possibly by as much as 2.8 times in some scenarios) will have a significant impact on the network.

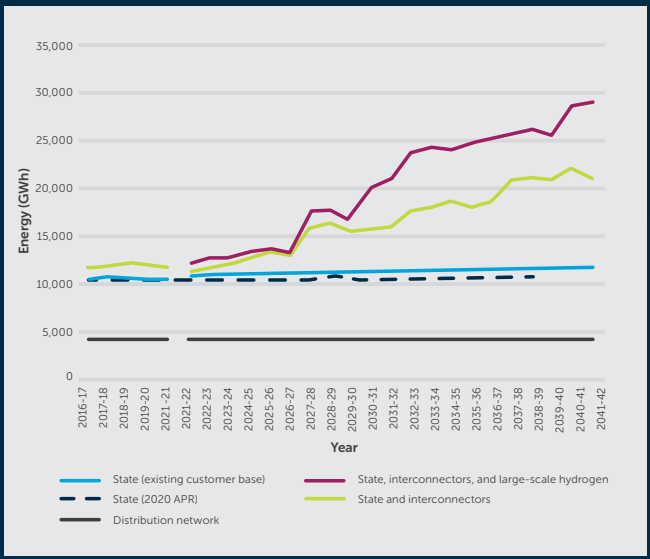
The uptake of photo-voltaic (**PV**) solar generation and battery-storage by Tasmanian customers is also going to increase, as is the use of EVs. In response to this, TasNetworks is planning to maximise its capacity to host DER and facilitate bidirectional flows to enable these technologies, while minimising the network augmentation needed to do so.

This bold expansion of Tasmania's renewable economy and the proliferation of DER is a key input into our planning for the Tasmanian electricity network. Our 2021 APR sets out what will be required from the network in the future to enable Tasmania's renewable energy transformation.

Marinus Link is a proposed 1,500 MW undersea interconnector between Tasmania and Victoria.

Future energy requirements

The energy transferred by Tasmania's transmission network is forecast to significantly increase with the construction of Marinus Link and expected growth in on-island renewable generation, as well as the development of large-scale hydrogen production in the State. The amount of energy transferred by the Tasmanian transmission network is expected to double by 2040 from the current level of approximately 11,500 GWh per annum.



Annual energy transfer forecasts

TasNetworks – our role and our network

TasNetworks is a State owned company which owns, operates and maintains the electricity transmission and distribution networks in Tasmania, as well as a telecommunications network which supports our operations. With total assets of over $3 billion, TasNetworks provides a network that ensures our customers receive a safe, reliable and affordable electricity supply of affordable supply of electricity.

Our transmission network connects 30 hydro-electric power stations, five wind farms and one thermal (gas-fired) power station. We provide the network capability that supports the Basslink high-voltage direct current (**HVDC**) interconnector and deliver high voltage electricity directly from the transmission network as required.

Our distribution network delivers electricity to some 290,000 households, businesses and organisations throughout Tasmania, including a number of large commercial and industrial enterprises taking power at high voltage.

The Tasmanian power system

Load and Demand

A relatively large portion of the energy used in Tasmania is supplied to ten large customers who are directly connected to the transmission network. Collectively, those customers – dominated by four major industrial customers – used 50 per cent of the total energy flow delivered through the TasNetworks transmission network.

Our 2021 APR assumes that the demand for energy from existing transmission-connected customers remains at existing levels. We have also adopted the energy and maximum demand forecasts for the existing Tasmanian customer base published by the Australian Energy Market Operator (**AEMO**) which shows modest growth at the whole of state level.

In developing the APR for 2021, we have considered three different, plausible development scenarios.

- existing customer base – modest increase in on-island demand;
- existing customer base plus increased interconnection – in addition to supplying existing customers, facilitate additional interconnection with mainland Australia through Marinus link; and
- existing customer base plus increased interconnection and large-scale hydrogen production – supplying existing customers, increased interconnection through Marinus Link and large scale hydrogen production facilities within Tasmania.

Under all three scenarios, the energy consumption and maximum demand of the existing customer base is forecast to increase moderately (by an average of 0.5 per cent annually), with increases largely driven by growth in residential consumption and EV charging. Overlaying this is the potential for significant increases in consumption and demand resulting from increased interconnection with the National Electricity Market (**NEM**) and the development of an export hydrogen industry.

We have also taken into account the most recent Integrated System Plan (**ISP**), published on 30 July 2020 by AEMO. The ISP is a whole-of-system plan that provides a roadmap for the efficient development of the NEM over the next 20 years and beyond. It identifies three Renewable Energy Zones in Tasmania for future development, and declares Marinus Link as an actionable ISP project.

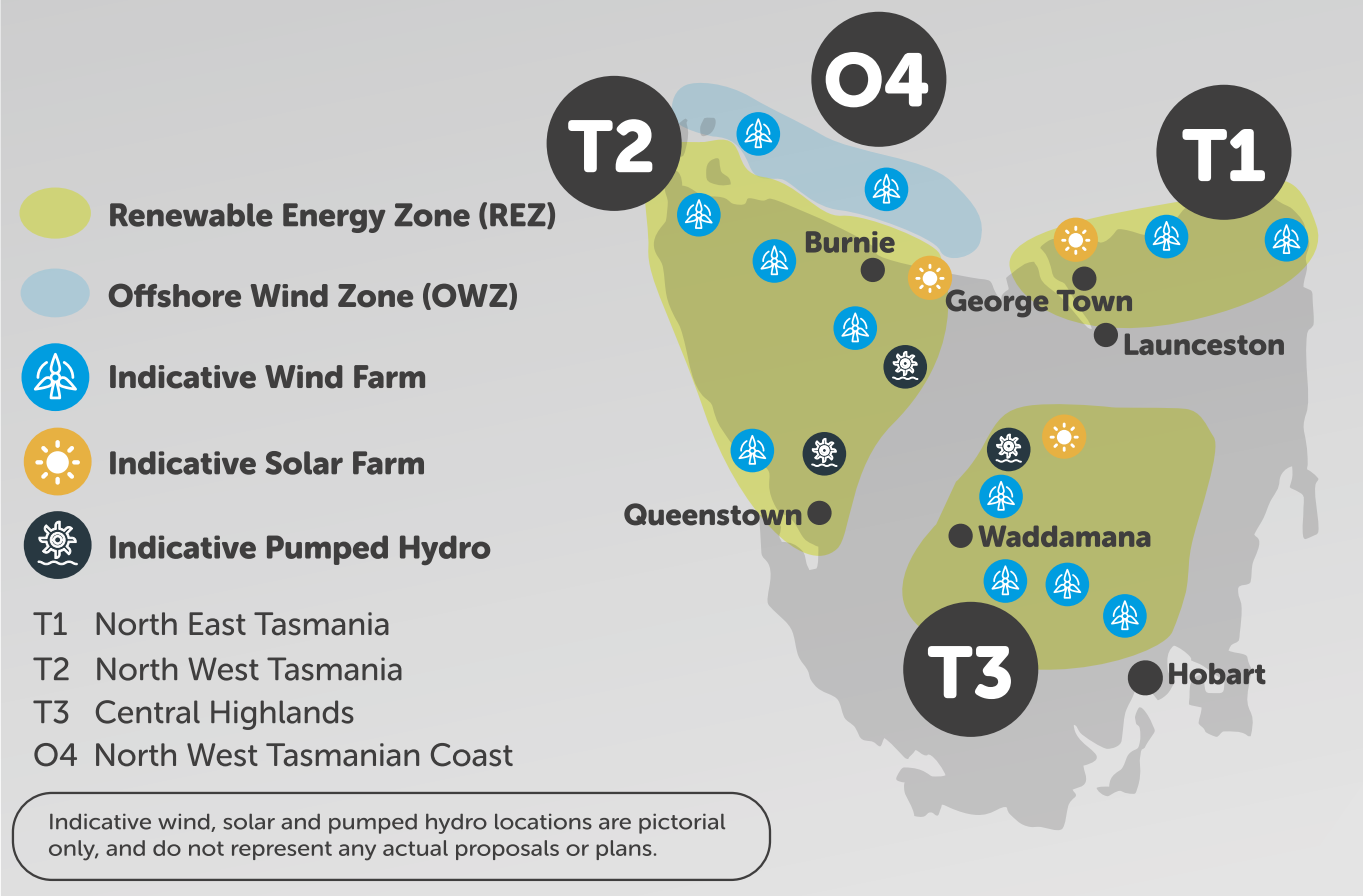
Supply

To meet the targets for renewable electricity generation in Tasmania set by the State Government, new generation is required, most of which is expected to be wind farms.

Delivering the TRET will see Tasmania's current baseline of 10,500 GWh per annum of renewable energy generation increase to 21,000 GWh by 2040. The interim target of lifting renewable generation in Tasmania to 150 per cent of 2022 levels by 2030 will see the output from renewable generation reach 15,750 GWh.

To achieve the 2030 target purely through new wind farms will require between 1,250 and 1,500 MW of extra installed wind generation capacity, while the 2040 TRET will require the addition of 2,500-3,000 MW of wind generation.

While other states are turning to renewable generation as a future source of energy, the wind resource quality in Tasmania is amongst the highest across the NEM and is a key part of our existing capacity. When looking to add more wind generation to the State's energy mix, Tasmania has the advantage of significant renewable hydro generation capacity to provide security and insurance for variable renewable energy sources.



Tasmanian Renewable Energy Zone

Renewable Energy Zones

AEMO has identified three Renewable Energy Zones (**REZs**) and one offshore wind zone (**OWZ**) in Tasmania. The above diagram illustrates the location of each Zone.

It is anticipated that the four REZs will be the locations for most of the new generation required to achieve the State Government's renewable energy target, as well as to support the proposed hydrogen production facilities and Marinus Link. REZ's indicate areas within the State which are known to be high quality renewable energy areas, however their existence does not preclude new renewable generation from being developed outside these nominated REZs.

Tasmania's energy future will require connection and transmission infrastructure to support the new renewable generation expected under the TRET. Integrating these quantities of variable renewable generation with the Tasmanian power system will require careful coordination by TasNetworks to preserve the reliability and stability of the State's transmission network while minimising the cost of delivering the additional energy required to double Tasmania's renewable generation output.

Our 2021 APR provides detailed analysis of the implications for network capacity across a range of scenarios, including the potential location of new generation and load across the REZs in Tasmania – as well as the implications for the cost of the network. The draft Tasmanian Renewable Energy Coordination Framework[1] focuses on an orderly delivery of sustainable and integrated large-scale renewable

energy projects across the REZs. TasNetworks is looking to work with all stakeholders to ensure that Tasmania achieves its renewable energy aspirations in the most efficient manner, by maximising the utilisation of existing assets and transmission corridors.

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1 https://www.stategrowth.tas.gov.au/rt/have_your_say_-_consultation/draft_renewable_energy_coordination_framework

Planning constraints and developments

For planning purposes TasNetworks divides Tasmania into four geographical areas: North West and West Coast, Northern, Central, and Southern.

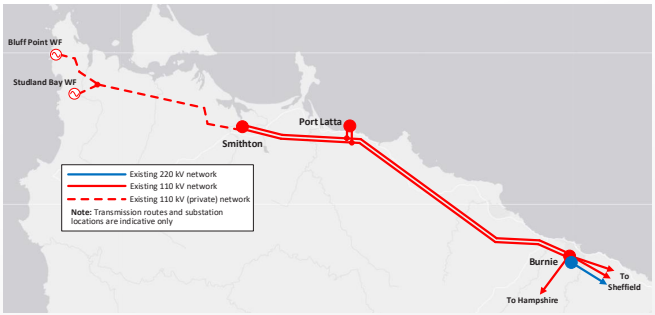
Planning for the transmission and distribution networks in each planning area takes into account a range of considerations including; energy and demand requirements; the available capacity (headroom) for new loads to be connected without the need for network augmentation; asset retirement and replacement plans; technical factors affecting the network and network performance within each planning area at a reliability-community level.

Chapter four of the APR, 'Area planning constraints and developments' provides information regarding each of the geographic planning areas including:

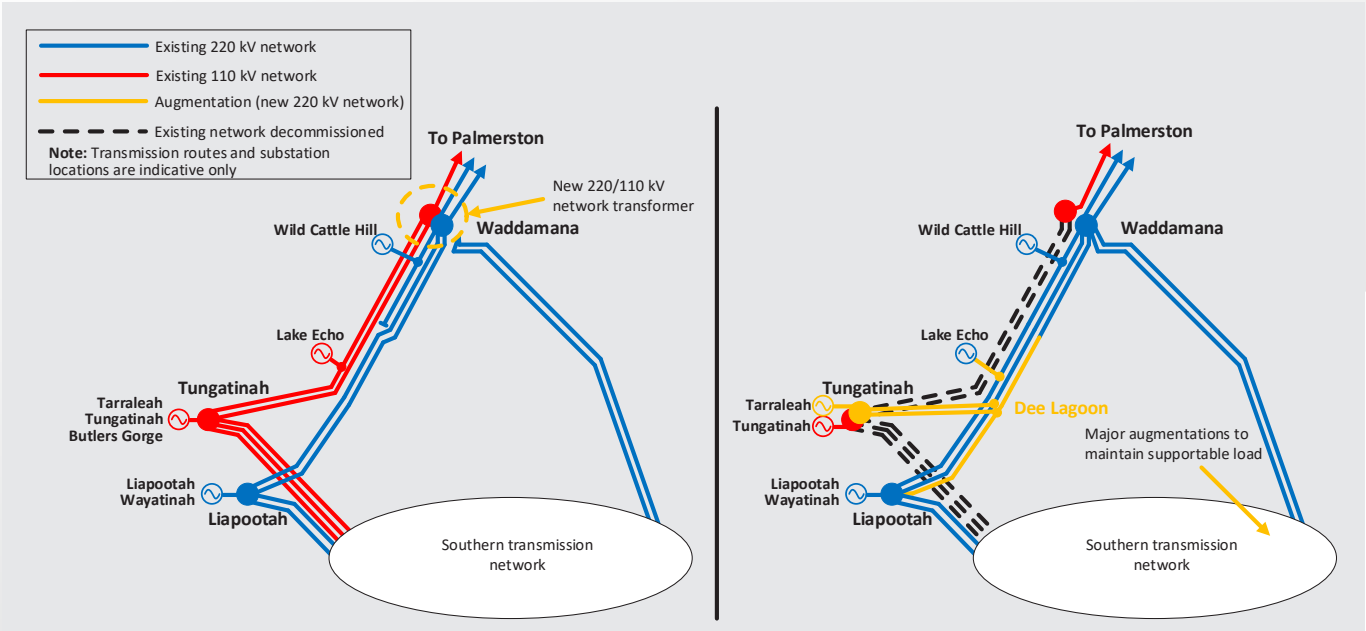
- network projects that are committed or that have been completed since the previous APR;
- proposed augmentation projects over the next ten years that address forecast network limitations;
- forecasts of future transmission-distribution connection points, including the location and description of the connection point, along with loading level, and estimated timing and cost;
- the available headroom for new load at each connection point substation;
- targeted reliability corrective action projects; and
- forecast network asset retirements over the next 10 years, including any de-ratings of assets.

In addition to developing the transmission network in the State's North West, the 2021 APR also identifies a range of opportunities for TasNetworks to facilitate more efficient transfer of renewable energy from the point of generation to the end-users.

These include installing a 220/110 kV network transformer at the Waddamana Substation in Southern Tasmania to more efficiently transfer power and reduce network losses, and the installation of a +/- 8 MVAr STATCOM at the Port Latta Substation to support the injection of energy by wind farms in the State's far North-West.



Burnie Substation and surrounding network



Options to reduce losses in Upper Derwent transmission network

Network security and reliability

In the context of the power system, the term 'security' refers to the safe scheduling, operation and control of the power system on a continuous basis.

A key factor that can affect power system security is the connection of inverter-based resources, such as wind and solar PV generation, as well as power exchanges across HVDC interconnectors.

Network security

Even without the addition of the new renewable generation envisaged under the TRET, the Tasmanian power system has reached the point where it is theoretically possible to supply all on-island demand using only inverter-based generation (i.e. wind farms and Basslink imports), without the need for any local synchronous generators to be online.

Two key aspects of network security, inertia and system strength, are inherently supplied by synchronous generators, such as hydro-electric or thermal generators. The variable nature of inverter-based generators, however, means that they do not contribute to inertia or system strength. Therefore, as the amount of energy injected into the power system from variable renewable generation increases, the system potentially becomes less resistant to fluctuations (in frequency, for example), posing a risk to power system security and reliability.

AEMO has declared shortfalls for both system strength and inertia network services in the Tasmanian region of the NEM.

As the Tasmanian transmission network service provider, TasNetworks is both the Inertia Service Provider and System Strength Service Provider for the Tasmanian region of the NEM. While investments in new transmission infrastructure may one day be needed to provide inertia and system strength, TasNetworks is committed to implementing the least-cost solutions for meeting any shortfalls in system strength and inertia. This approach has already seen TasNetworks procure system strength and inertia services from the operators of synchronous generators in Tasmania, to address the shortfalls identified by AEMO, as an alternative to more costly, capital-intensive solutions.

Against a backdrop of ever-greater contributions to the State's supply of electricity from variable renewable generation, maintaining power system security is set to become increasingly important, and the 2021 APR devotes considerable analysis of the constraints which have the potential to affect system security in the future.

Network reliability

Transmission network reliability is monitored and reported to the Australian Energy Regulator (AER) and Office of the Tasmanian Economic Regulator (OTTER). Under the service target performance incentive scheme (STPIS), the AER sets service targets in terms of the number of loss of supply (LOS) events that occurred during the year, circuit outage rate, and the average LOS event duration, based on historical performance.

Distribution network reliability is reported to the AER and OTTER on a geographic segmentation basis. Tasmania is divided into 101 reliability communities, with each assigned to one of five reliability categories. We report on the frequency and duration of outages at community and category level to OTTER, with targets set in the Tasmanian Electricity Code (TEC). We report at a category level only to the AER as part of our STPIS, with targets based on historical performance. Network reliability is a critical aspect of TasNetworks' customer service and involves balancing cost, risk and performance to deliver affordable levels of supply reliability and quality to customers.

The APR recognises this and provides information about the network reliability targets applying to TasNetworks, our performance against those targets, the issues that impact on network reliability, and our plans to ensure compliance.

To read the full TasNetworks 2021 Annual Planning Report, please visit: www.tasnetworks.com.au/apr

Contact Tasnetworks

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