

Grid Vision 2040

Appendix 26



Tasmanian Networks Pty Ltd



Transend Networks Pty Ltd



TRANSEND NETWORKS PTY LTD

GRID VISION 2040

Grid Vision 2040 outlines Transend's current operating environment, the challenges we face, and our strategy moving forward. It is a road map for the long-term future development of the transmission network in Tasmania, which complements our annual planning cycle. Grid Vision is subject to review every 5 years.

Transend Networks Pty Ltd is the owner and operator of the electricity transmission system in Tasmania. We deliver electricity from Tasmanian power stations, and from the mainland via Basslink, to our customers.

We have a variety of transmission customers, including generators (such as Hydro Tasmania), networks (such as Aurora Energy) and several major industrial loads.

We participate in Australia's National Electricity Market (NEM), which operates on an interconnected power system extending from Queensland to South Australia. Basslink connects Tasmania to the NEM.

We are a State Owned Company with the principal objectives of operating a sound commercial transmission business, while providing sustainable returns to our shareholders.

General information about Transend is available at our website www.transend.com.au

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Transend provides no surety that all or any of the projects or network changes proposed in this document will occur in part or entirety. Forecasts and future projects are based on information available at the time this document was compiled and are subject to change. It is recommended that interested parties contact Transend directly to discuss specific details.



OUR VISION AND OBJECTIVES

Our goal is to be a leader in developing and maintaining sustainable networks through carefully balancing a number of economic, social and environmental objectives. The principles of sustainability underpin our corporate plan and play an important part in informing our decision-making processes.

To guide our sustainability efforts, we have adopted the Sustainable Practice Framework developed by the Energy Supply Association of Australia.

OUR EXISTING OPERATING ENVIRONMENT

Electricity demand in Tasmania is increasing annually, but the rate of increase is projected to be relatively small (in the order of 0.79 % per annum for the period 2010 to 2024).

The supply to the greater Hobart area will continue to pose the biggest challenge in the future as it has the highest load growth projection of around 2% per annum (2010 projection).

Joining the National Energy Market (NEM) in 2005 led to a change in our transmission load profile from a relatively stable and consistent load range, to one that sees significant load changes when generators trade electricity through Basslink.

We provide a connection to Basslink to meet demand requirements and allow flexibility in the local generation base.

We are increasing our use of real time load monitoring and initiatives to improve our approach to dynamic system rating.

The management of voltage stability is becoming increasingly challenging in the greater Hobart area, George Town and the north-west.



WHY GRID VISION 2040?

Tasmania requires a resilient transmission network which provides a safe, secure and affordable electricity supply and caters for future changes in generation and load patterns.

Grid Vision represents the culmination of estimates of electricity demand and consideration around constraints and opportunities for development based on a number of different likely scenarios.

On the basis of the latest forecast analysis, planning for the future will likely rely on gaining efficiencies in the existing network, rather than building significant amounts of new network.

Grid Vision applies a balanced approach to meeting future demand through investment in additional capacity and the implementation of new technologies to achieve greater utilisation of existing assets.

DEMAND FORECASTING

Grid Vision 2040 is largely driven by demand and generation forecasts. By analysing the demand trends we are able to plan the most efficient and effective electricity network. Essentially, demand for increased power transmission is not growing as expected: **Figure 1** shows the future demand forecast taking into account low, medium or high growth scenarios.

- In 2007, the forecast for maximum demand was in excess of 2300 MW by the year 2020, potentially requiring a network upgrade of our existing 220 kV system to higher capacity infrastructure (either 330 kV or 500 kV).
- Maximum demand forecast has since (2010) been revised down to a little over 2100 MW by the year 2020 and this has minimised the need to upgrade the system to a higher capacity infrastructure.
- Our analysis shows that increased capacity of the main 220 kV system, if required, can be achieved through the application of new technology and innovations, negating the need to increase the core grid voltage.
- Our emphasis moving forward will be on using technology to deliver a higher level of efficiency through our existing network.

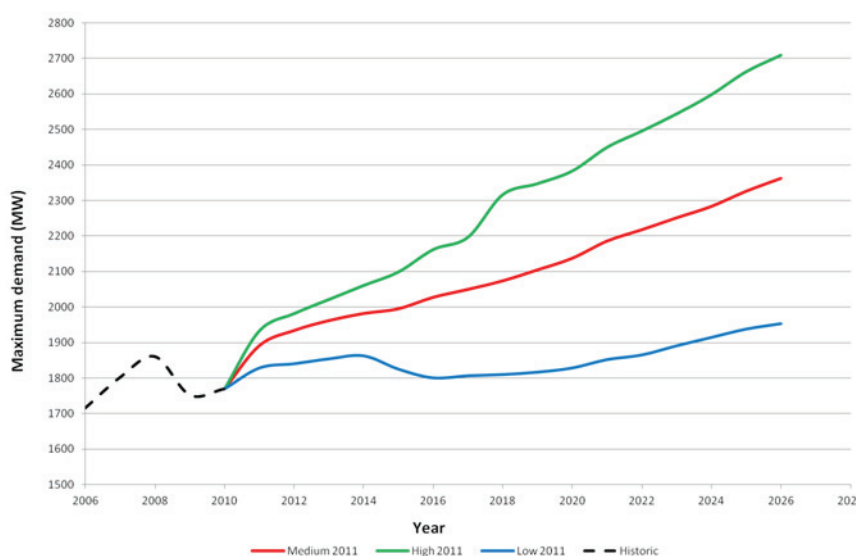


Figure 1 Forecast of total Tasmanian winter maximum demand (2011)

Grid Vision 2040 will develop a resilient transmission network with sufficient flexibility to adapt to future demands.

GENERATION IN THE SYSTEM

Electricity generation in Tasmania is predominately provided by hydro power as shown in **Figure 2**. The contribution to the generation source mix from wind farms and other forms of renewable generation, such as geo-thermal, is expected to increase in the future with the construction of new plants. These potential new projects could also see Transend expand its network to enable access to new generators.

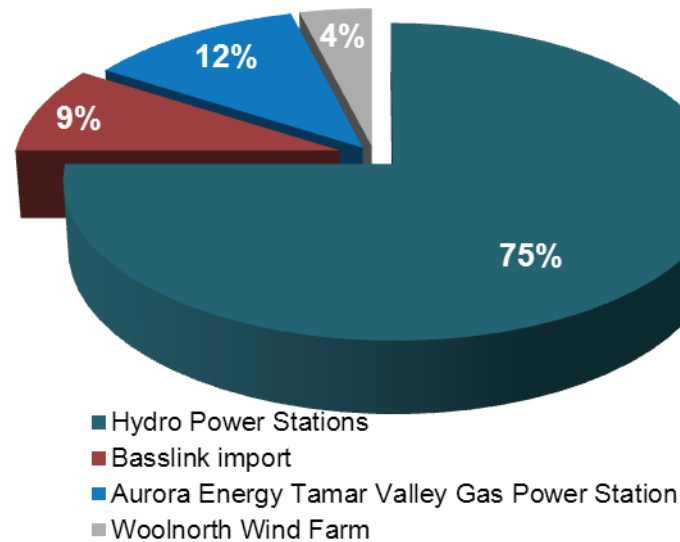


Figure 2 Energy supply in Tasmania (2010–11)

Figure 3 shows the forecast increase in energy generation required to satisfy future load growth scenarios.



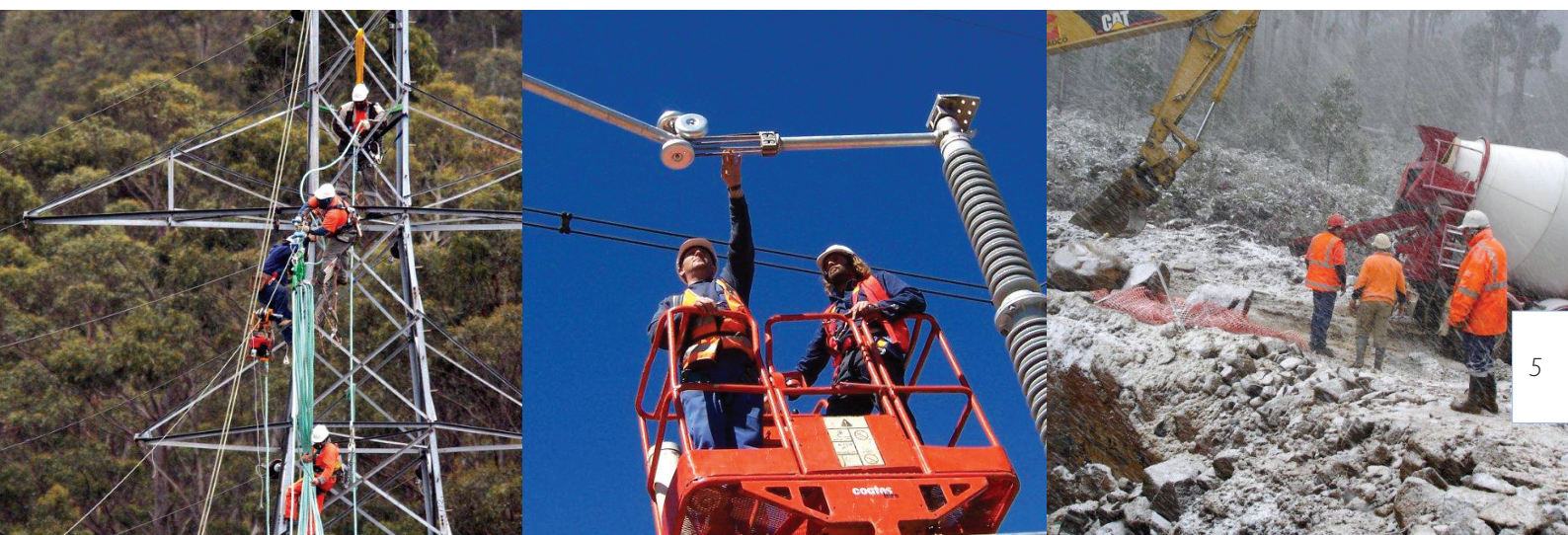
Figure 3 Forecast of total Tasmanian electrical energy generation required to meet demand

OUR CHALLENGES

In utilising the existing network we face a number of challenges including:

- *Asset life*: some of our assets are reaching their end of service life and will require us to make decisions about whether we refurbish, repair or replace the infrastructure.
- *Different energy profile*: new renewable energy such as wind, geothermal and tidal, rely on weather conditions and can be less predictable sources of supply.
- *Pressure to make operational decisions on short notice*: trading in the NEM has provided opportunities for generators to become more entrepreneurial in the buying and selling of electricity. This can place additional pressure on the way we operate our system to make quick decisions, which could increase the level of risk to the reliability, security and consistency of supply we provide.
- *Network stability*: our customers demand and expect a high quality of electricity supply. Managing voltage and frequency stability will become an increasingly important issue for us in the future.
- *Responsiveness*: managing new demand, business investment and timing within our existing business processes is a challenge we face. The planning and lead time required to upgrade lines, make changes or install new infrastructure is not well understood by the broader community.
- *Certainty of big users*: new or existing industrial loads may require considerable increases (or decreases) in transmission services.
- *Changing regulatory environment*: Transend's business is regulated under the National Electricity Rules. These rules are reviewed from time to time and affect how we plan for, invest in and operate the network.
- *Changing policy environment*: a number of new government initiatives may impact our operation, including:
 - Retail contestability to the electricity market.
 - National renewable energy target.
 - The impact of carbon emissions pricing on the:
 - » operation of major energy consumers
 - » cost of electricity production due to changes in the generation mix.
- *Profile*: the role that Transend plays in the electricity market and the value we add to Tasmania is not well understood by the community.

Grid Vision 2040 is Transend's response to these challenges.



FUTURE NETWORK PLANNING

To respond to our challenges and future demands of our customers and stakeholders, strategic plans have been developed for each of Tasmania's network regions, where opportunities and options are being considered. These include, for example:

- Increase connectivity in the transmission network, which will increase reliability and quality of supply;
- Creating alternative supplies from other areas;
- Building network redundancy or back-up plans;
- Adopting protective measures to enhance the reliability and resilience of the system;
- Providing network information and related data to assist new entrants;
- Introducing flexible connection arrangements for new entrants; and
- Investigating technical innovations to ensure system stability and support the flexibility and reliability needs of all users.

Detailed information for each planning region and the system backbone is provided from page 9 onwards.

FUTURE SMART TRANSMISSION GRIDS

The smart electricity grid of the future will bring forward new capabilities and services that utilities can offer to customers, such as:

- dynamic pricing;
- real-time feedback about electricity consumption, peak demand and greenhouse gases emitted;
- demand response programs;
- micro grids with distributed generation and storage devices in parallel operation with the grid; and
- electric vehicles, including recharging arrangements.

The application of new intelligent devices and the latest technology will increase utilisation of the existing transmission network and assets, balancing risk and reliability requirements without the need for a massive investment in the transmission network and assets.

Developing smart tools to provide improved situational awareness in response to system events.

DELIVERING ENERGY

Transend is integral to the future economic and social development of Tasmania. Without an efficient and effective electricity network, the state cannot grow and prosper. In this regard, we are a conduit for Tasmania's future development and work as an enabler in partnership with customers and stakeholders to facilitate their development.

FUTURE DEVELOPMENTS OVERVIEW

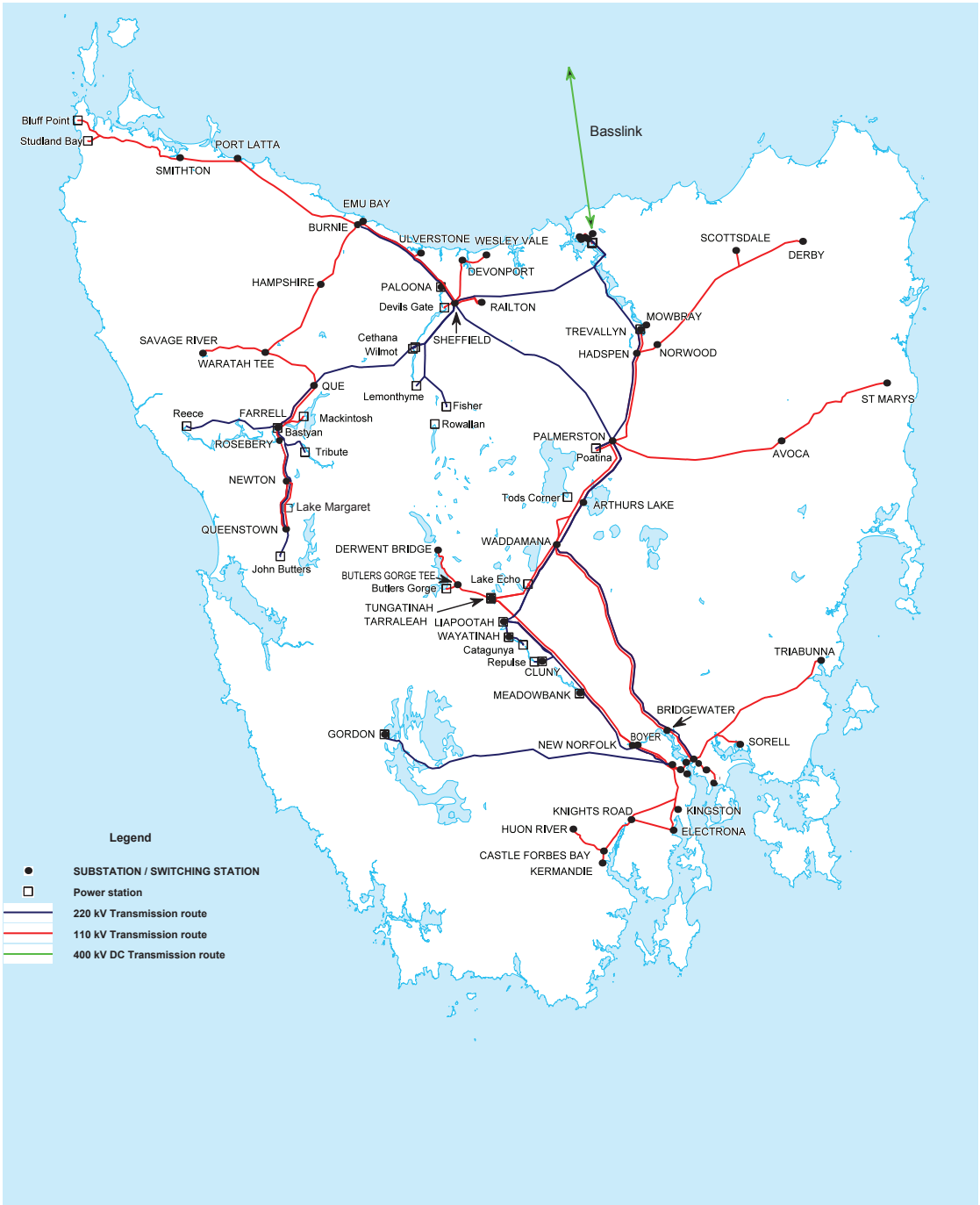


Figure 4 Transend's current transmission grid

FUTURE DEVELOPMENTS OVERVIEW



Figure 5 Transend's proposed transmission grid in 2040

The information displayed in **Figure 5** details how the Tasmanian transmission network is forecast to look in 2040, considering the most likely prevailing conditions. Development of new infrastructure is dependent upon future load growth, reliability and market drivers, regulatory changes, and policies. We carefully monitor all of these factors and decisions on new projects will be developed in collaboration with our customers.

FUTURE TRANSMISSION SYSTEM

The transmission backbone¹ (220 kV) may require further development in the coming years, with scope ranging from the introduction of new transmission lines, through to switchyard improvements and redevelopment. Details of some of these key changes follow.

New proposed transmission lines for:

- Palmerston–Sheffield
- Waddamana–Palmerston
- Sheffield–Burnie
- Farrell–Burnie
- Chapel Street–Lindisfarne

Switchyard improvements for:

- Waddamana
- Palmerston
- Chapel Street
- Liapootah
- Farrell
- Hadspen

New switchyard arrangements for Tungatinah-Tarraleah, and an upgrade for the Palmerston to Sheffield line, could allow several 110 kV lines to be decommissioned (see **Figure 8**), including:

- Lake Echo to Waddamana
- Tarraleah to New Norfolk
- Waddamana to Bridgewater

In each of the three main areas of the state (South, North and North West) there are potential future voltage issues, which may require devices to provide resilience and fast responses to these potential voltage issues.

CAPITAL INVESTMENT

Grid Vision 2040 forecasts potential capital investment² in the order of **\$823M³** for the transmission backbone infrastructure in the next 25 years.

Supporting the backbone transmission network are three main regional networks. These are located in the following areas and are shown along with their expected additional capital expenditure in the next 25 years:

- North West and West Coast; **(\$138M)**
- North and North East; **(\$691M)** and
- South and East Coast. **(\$452M)**

Development options for each of these areas is detailed further in the following sections.

¹ The developments, upgrades and capital investment highlighted in the following sections are premised on the information available at the time this document was compiled and may change into the future.

² Financial details provided in Grid Vision 2040 are only for new capital work. The financial details quoted do not include for future normal augmentation or maintenance work that may be required to existing system.

³ All capital investment figures are shown in 2010 dollar values.

APPENDIX

NORTH WEST AND WEST COAST

New substations are potentially required in Queenstown and Farrell. These would allow for new zone substations at Strahan, Zeehan, Renison, Rosebery and Mt Lindsay to be installed by Aurora Energy, subject to future demand. New switchyards are also proposed at Queenstown and Farrell. A 220 kV network upgrade would be required for the Burnie to Farrell and Burnie to Sheffield lines.

Figure 6 depicts the West Coast future supply arrangement options.

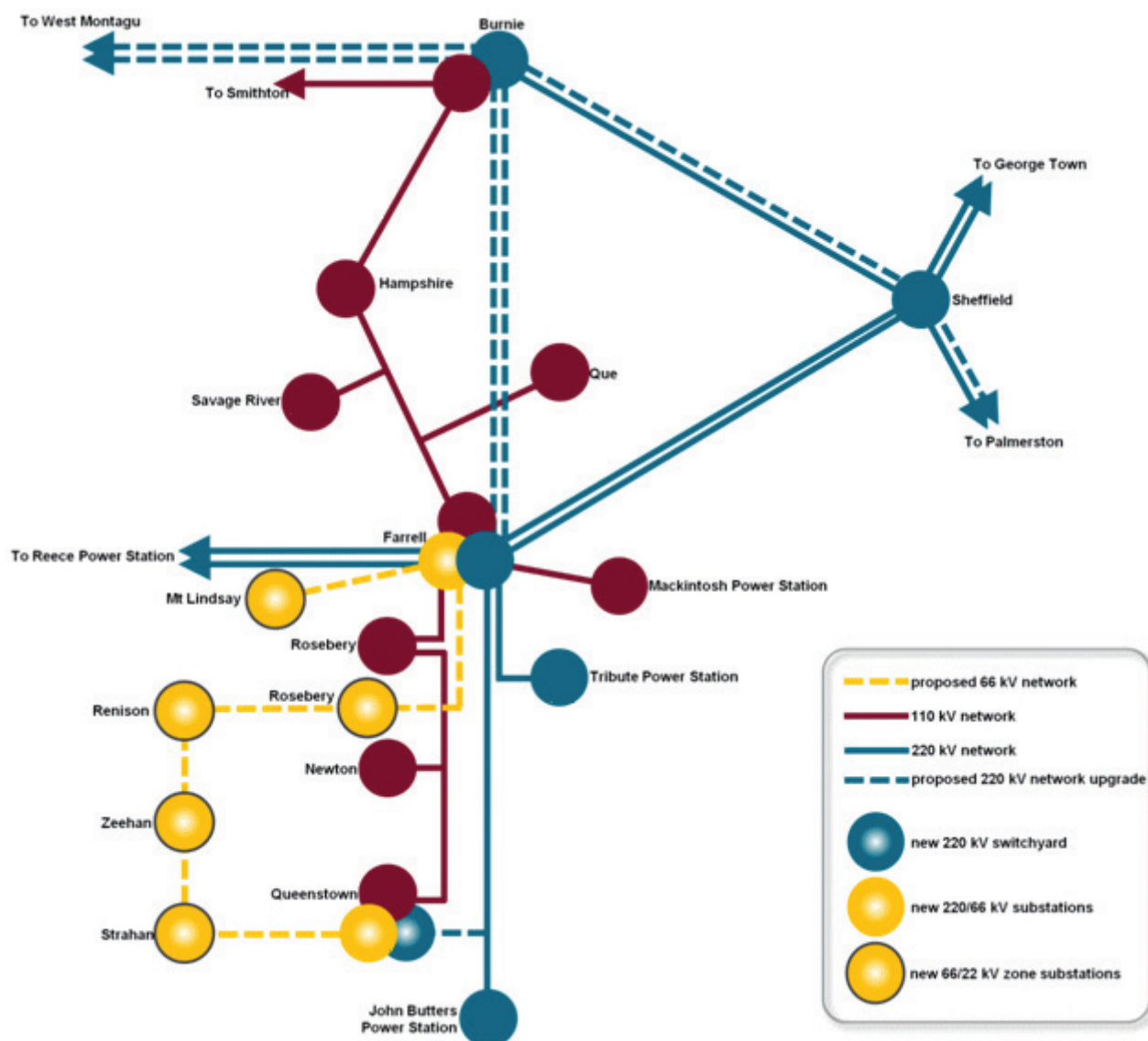


Figure 6 West Coast future supply arrangement options

NORTH AND NORTH-EAST

One of the key challenges for us in the North is the provision of secure supply to a diversified portfolio of customers. It is vital that we increase system resilience and maximise system integrity. Upgrades at George Town could assist us to deliver these requirements. A second 220 kV injection point into Launceston is also planned, along with closing of the 110 kV circuit between Derby and St Marys. New substations are planned for Launceston, Exeter, Longford, Ashley, and Tunbridge, subject to demand.

Figure 7 shows the proposed north and north-east supply arrangement to be in place in 2040.

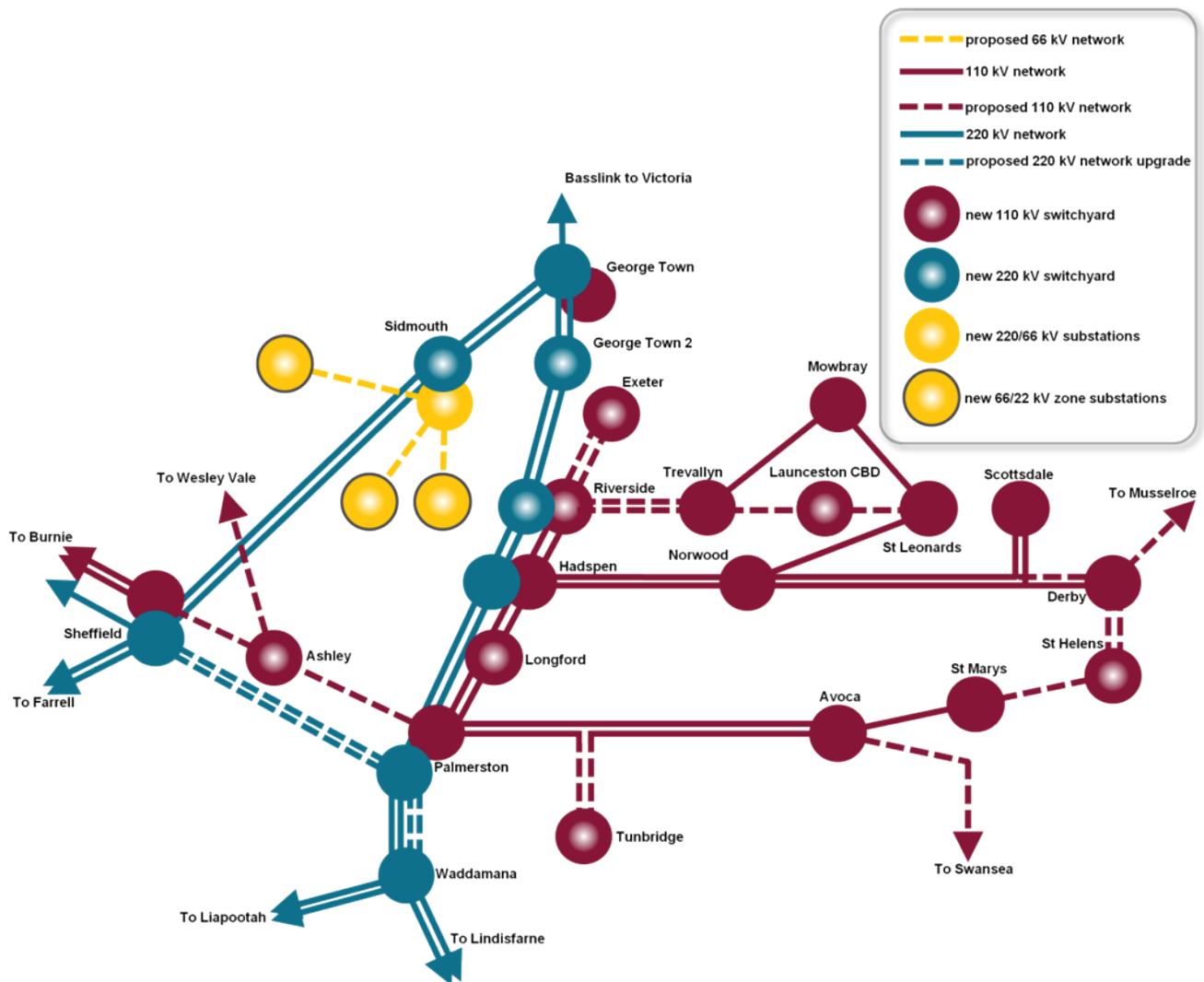


Figure 7 Proposed North and North East supply arrangements

SOUTH AND EAST COAST

A new 220 kV switchyard may be required for Risdon as part of the plan to install a 220 kV link between Lindisfarne and Chapel Street. New substations are also proposed for Cascades, Richmond, Dunalley and Swansea, subject to demand increases. A substantial number of 110 kV and 220 kV line upgrades are also proposed including a link between Mornington and Sorell, and closing the 110 kV link between New Norfolk and Bridgewater.

Further details of this arrangement are illustrated in **Figure 8**.

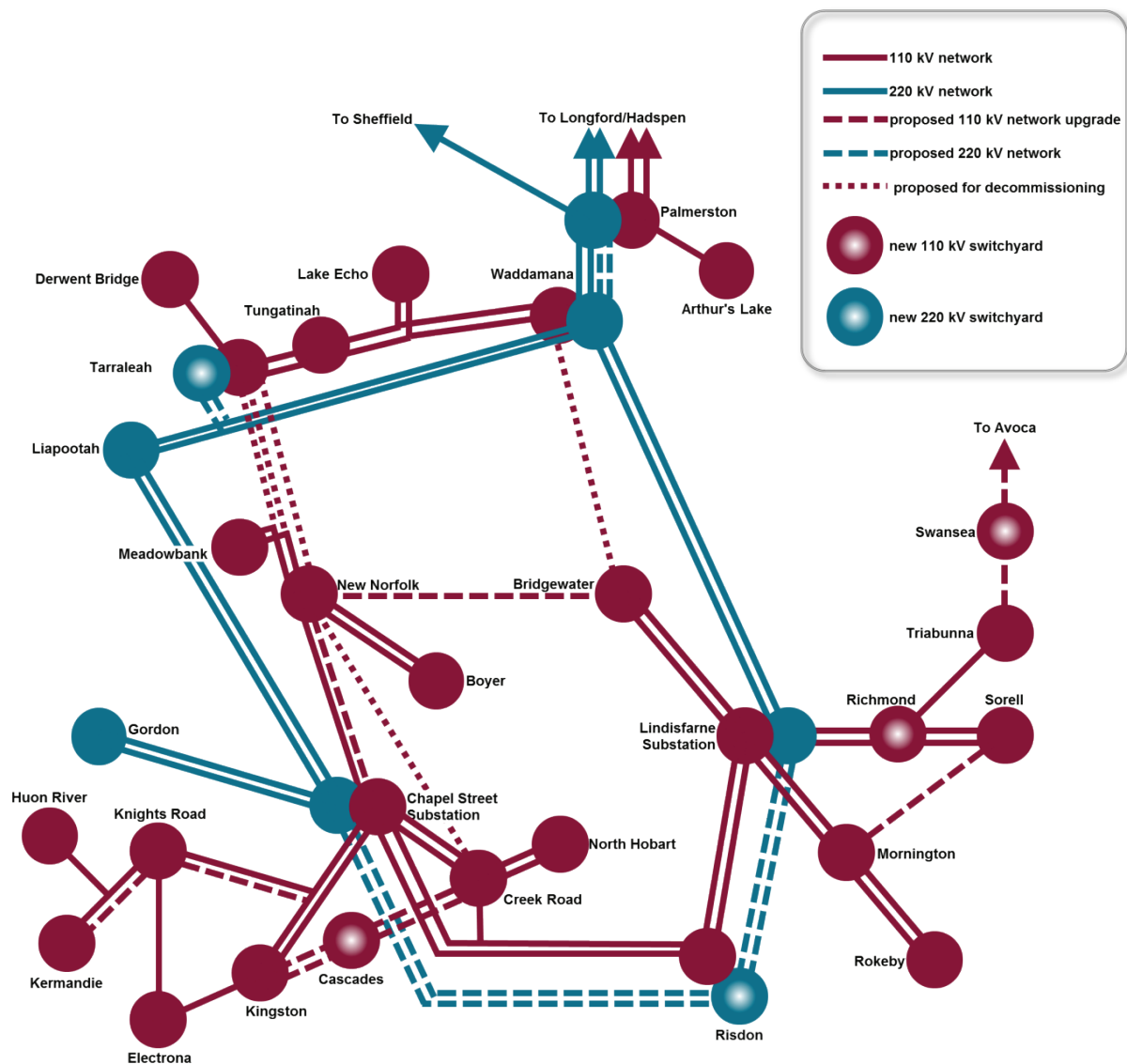


Figure 8 Proposed South and East Coast supply arrangement