Meeting Network Planning Requirements at George Town

Project Specification Consultation Report

29 November 2024

Official

TasNetworks Powering a Bright Future

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TasNetworks acknowledges the palawa (Tasmanian Aboriginal community) as the original owners and custodians of lutruwita (Tasmania). TasNetworks, acknowledges the palawa have maintained their spiritual and cultural connection to the land and water. We pay respect to Elders past and present and all Aboriginal and Torres Strait Islander peoples.

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Glossary

AACE	Association for the Advancement of Cost Engineering
AEMO	Australian Energy Market Operator
ESOO	Electricity Statement of Opportunities
ISP	Integrated System Plan
MVAr	Megavolt-Ampere reactive
NEM	National Electricity Market
NER	National Electricity Rules (Version 216 referenced throughout this document)
NPR	Electricity Supply Industry (Network Planning Requirements) Regulations 2018
PADR	Project Assessment Draft Report
PSCR	Project Specification Consultation Report
RIT-T	Regulatory Investment Test for Transmission
TNSP	Transmission Network Service Provider
TRHAP	Tasmanian Renewable Hydrogen Action Plan

Executive Summary

This Project Specification Consultation Report (PSCR) represents the first step in the application of the Regulatory Investment Test for Transmission (RIT-T) to options for addressing minimum network performance requirements at George Town in the Northeast of Tasmania with new large scale load connection.

George Town Substation is the sole substation supplying the George Town area. It is the connection point for generation and Basslink, the HVDC interconnector which links the Tasmanian and Victorian networks. It also supplies transmission connected customers at Bell Bay, a major industrial area in Tasmania.

The Australian and Tasmanian Governments have agreed to develop Bell Bay as one of Australia's first Hydrogen Hubs. This follows the Tasmanian Government publishing the Tasmanian Renewable Hydrogen Action Plan (TRHAP)[1] in 2020 that envisions Tasmania as a major producer and exporter of hydrogen by 2030. In response, TasNetworks received a number of connection enquires from proponents seeking to establish hydrogen production facilities in Bell Bay, supplied out of George Town substation.

As load increases at George Town, issues begin to emerge on the shared transmission network. Specifically, the power system begins to approach operating conditions that are no longer compliant with the minimum network performance requirements outlined in the Electricity Supply Industry (Network Planning Requirements) Regulations 2018 (NPR)[2].

The NPR provide the customer reliability levels to be considered in planning Tasmania's transmission network. Importantly, Regulation 5 of the NPR specify that power system planning must be such that load that is interrupted by a single asset failure is not to be capable of resulting in a black system.

Identified need: meeting network performance requirements

Two main issues arise in the network following new load connection at George Town. Both these issues are related to the minimum network performance requirements in the NPR. TasNetworks is undertaking this RIT-T to assess credible options to meet externally imposed service standards outlined in the NPR. Therefore, the identified need for this investment comprises a reliability corrective action.

Specifically, as the NPR are deterministic reliability requirements, any new load exceeding 210 MW connecting to George Town Substation will require a reliability corrective action to meet the NPR, in preventing the occurrence of a system black event.

Compliance with NPR: Single contingency size

George Town is dominated by major industrial loads with a largely flat consumption profile throughout the year. The proportion of this load to total state demand, varies between 40-57% seasonally. The addition of 210 MW or more of new load at George Town will at times equal or exceed 60% of the total state load.

The NPR compliance breach is due to a single asset failure, such as a catastrophic failure of one of the network transformers or 220 kV bus at George Town substation, resulting in an outage of the entire substation. If 60% or more of the state demand is lost, this is classified as a system black condition.

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[1] https://recfit.tas.gov.au/policies_strategies_plans/renewable_hydrogen_action_plan
[2] https://www.legislation.tas.gov.au/view/whole/html/inforce/current/sr-2018-002

Demand reduction or network augmentation is likely required to allow new loads to connect to maintain compliance with this NPR requirement.

Compliance with NPR: Voltage stability

As the load increases at George Town, the stability of the voltage waveform is more severely impacted by fault events, potentially leading to undamped oscillation and cascading failure of the network—a system black event. To ensure that acceptable voltage stability is maintained, constraints are applied to Basslink export and Tasmanian generation to manage the reactive power margin requirements defined under Chapter 5 of the National Electricity Rules (NER).

Such constraints can restrict the amount of energy from marginal generators to the market, contributing to an increase to the energy spot prices in the market.

Following the connection of additional load at George Town, the network is exposed to increased periods of stability risks. Network constraints are a function of Basslink export and local Tasmanian generator dispatch, and at a certain point may no longer be effective to manage the risk.

Potential network solutions

TasNetworks has identified one integrated solution to address both aspects of the identified need, which comprises the following augmentation works:

- Reconfiguration of the existing 220 kV switchyard at George Town Substation;
- Establishment of a new 220 kV switchyard connected to George Town Substation to facilitate new connections; and
- Installation of dynamic reactive support

These works are proposed to address the identified need that emerges as a result of new load connections, and account for the uncertainty of the precise size and location of new connections, given the combined interest from multiple proponents in the surrounding area.

Non-network options may be able to assist with this RIT-T

Non-network options have been considered as a potential solution to assist in managing the emerging network risks from new load connections at George Town.

To be considered acceptable solutions to address the identified need, non-network options would need the following characteristics:

- Reduce the percentage ratio of George Town substation load of the total network load; and/or
- Offset the stability impacts to the network brought about from new load connections to the network

Preferred option will be identified in the PADR

TasNetworks will assess the costs and benefits of the potential credible options identified in this PSCR, as well as any other solutions identified through the consultation period. Consistent with the NER and the RIT-T Instrument, TasNetworks will only consider benefits that will materially impact the selection of the preferred solution.

TasNetworks will present the findings of this analysis in the Project Assessment Draft Report (PADR), which must be published within 12 months of the PSCR consultation period ending.

The PADR will also include:

- A description of which credible options have been assessed;
- Indicative costs of each credible option as informed by feedback to this PSCR;
- A description of the methodologies used to quantify costs and benefits;
- A net present value analysis for each credible option; and
- A proposed preferred option taking into account the net present value analysis as well as any other considerations deemed appropriate and allowable within the RIT-T framework.

Next steps

TasNetworks is seeking stakeholder submissions on the various issues and credible options that have been presented as part of this PSCR. We are particularly interested in receiving submissions from non-network service providers.

TasNetworks is seeking submissions to this PSCR over a 13-week period ending 28 February 2025.

We will publish the PADR within 12 months of the end of the PSCR consultation period. Stakeholders will also have an opportunity to comment on the results of the PADR during the 6-week consultation period.

Introduction

This Project Specification Consultation Report (PSCR) represents the first step in the application of the Regulatory Investment Test for Transmission (RIT-T) to options for addressing minimum network performance requirements at George Town, located in the Northeast of Tasmania.

George Town Substation is the sole substation supplying the George Town area. It is the connection point for several generator customers and Basslink, the HVDC interconnector which links the Tasmanian and Victorian networks. It also supplies Bell Bay, a major industrial area in Tasmania. As such, it is the largest single load centre in the Tasmanian region.

The Australian and Tasmanian Governments have recently agreed to develop Bell Bay as one of Australia's first Hydrogen Hubs. This follows the Tasmanian Government publishing the Tasmanian Renewable Hydrogen Action Plan (TRHAP) that envisions Tasmania as a major producer and exporter of hydrogen by 2030. In response, TasNetworks has received a number of connection enquires from proponents seeking to establish hydrogen production facilities in Bell Bay.

As load increases in George Town, issues begin to emerge on the shared transmission network. Specifically, the power system begins to approach the minimum network performance requirements outlined in the NPR[3].

The NPR provide the customer reliability levels to be considered in planning Tasmania's transmission network. Importantly, Regulation 5 of the NPR specify that power system planning must be such that load that is interrupted by a single asset failure is not to be capable of resulting in a black system.

Should sufficient new load eventuate in George Town, TasNetworks would not meet this obligation because, at times of operation, a loss of George Town substation load resulting from a single asset failure would be considered system black.

TasNetworks is therefore examining options for addressing minimum network performance requirements to ensure reliability of the power system following large scale load connections in George Town. TasNetworks is undertaking this RIT-T to meet the externally imposed service standards outlined in the NPR. Consequently, we consider the identified need for this investment is for reliability corrective action.

The next section of the report describes the identified need and why it is important to customers. That is followed by details of the circumstances leading to the identified need, including forecast demand. Options are presented to meet the identified need, with a statement of the technical characteristics required for non-network options.

An outline of credible options to meet the identified need includes:

- the technical characteristics of the credible options;
- whether credible options are likely to have an inter-regional impact;
- the classes of market benefits that TasNetworks considers are likely to be immaterial;
- the estimated construction timetable and commissioning date of credible options; and
- indicative costs for each credible option.

The report also provides information of the next steps of the RIT-T process.

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[3] https://www.legislation.tas.gov.au/view/whole/html/inforce/current/sr-2018-002

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Appendix A provides references to information that must be included in the Consultation Report. The RIT-T process is contained in Appendix B to this report.

Identified need

The purpose of this RIT-T is to identify the investment option that meets the identified need outlined in this section while maximising net economic benefits in the National Electricity Market (NEM) and meeting Tasmanian reliability standards.

This section outlines background information related to Tasmania's reliability standards and the George Town area.

Background to the identified need

TasNetworks has received considerable interest from new load proponents looking to connect to the transmission network in and around George Town in Tasmania's Northeast. Most of the connection enquiries relate to proponents seeking to establish large scale hydrogen production facilities consistent with the Tasmanian Government's Renewable Hydrogen Action Plan (TRHAP).

The TRHAP is the Tasmanian Government's plan to establish Tasmania as a leader in large-scale renewable hydrogen production.

On 18 January 2024, the Australia Government announced funding to support the development of a hydrogen hub in Bell Bay, which is located in the George Town area. Bell Bay was chosen due to its access to:

- certifiable renewable energy;
- high-quality fresh water; and
- significant vacant industrial land near deep-water port facilities.

The Bell Bay Hydrogen Hub will support:

- the production of up to 45,000 tonnes of green hydrogen per year – enough to fuel over 2,200 heavy vehicles for a year;
- 740 jobs for energy specialists such as engineers and technicians, while hub construction will provide work for local skilled trades like concreters, plumbers, fitters and electricians; and
- the manufacture of green metals and alloys like iron, aluminium and steel.

The interest from potential hydrogen proponents for transmission network connections exceeds the existing available network capacity supplying the Bell Bay area, and some level of network augmentation will be required. The TRHAP promotes progressive development of hydrogen production over the medium to longer term planning horizon. TasNetworks has developed planning scenarios for three successive stages of new hydrogen production loads:

- Stage 1: 300 MW
- Stage 2: 700 MW
- Stage 3: 1,000 MW

TasNetworks has previously received connection enquiries and pre-enquiries for hydrogen connections totalling over 500 MW. On the balance of probabilities, we expect a material increase in load at George Town, sufficient to trigger the identified need during the 2024-2029 regulatory control period. Accordingly, this RIT-T is focused on options to support load connection of 300 MW.

Overview of TasNetworks' Reliability Obligations

The NPR provides the customer reliability levels to be considered in planning Tasmania's transmission network. Importantly, Regulation 5 of the NPR specifies that power system planning of the transmission system is to meet the following network performance requirements:

In regards to an intact network:

i. no more than 25 MW of load is to be capable of being interrupted by a credible contingency event; and

ii. no more than 850 MW of load is to be capable of being interrupted by a single asset failure; and

iii. load that is interrupted by a single asset failure is not to be capable of resulting in a black system; and

iv. the unserved energy to load that is interrupted consequent on damage to a network element resulting from a credible contingency event is not to be capable of exceeding 300 MWh at any time; and

v. the unserved energy to load that is interrupted by a single asset failure is not to be capable of exceeding 3,000 MWh at any time.

In the context of this Regulation, a single asset failure means one single incident (other than a credible contingency event) that results in the failure of one single asset to perform its intended function.

For the purposes of meeting these requirements, the NPR adopts the definition of black system under the NER. Australian Energy Market Operator's (AEMO's) Power System Security Guidelines[4] provide a measurable basis for determination of system black events for the purposes of meeting its reliability responsibilities.

The guidelines define a black system in a region as loss of more than 60 per cent of predicted regional load, following a major power system emergency, affecting one or more power stations.

Overview of voltage stability requirements

One of the contributing factors leading to a system black event is widespread and severe voltage collapse. The network is designed and operated such that voltages remain within acceptable operating ranges during normal operation, and acceptably recover following disturbances.

With respect to the NPR, single asset failure events, such as a transmission line or tower failure, are capable of causing voltage disturbances, that if not managed, could result in a system black event.

The requirements for steady state operation, and the stability criteria for transient and oscillatory behavior of voltage are defined under Chapter 5 of the NER.

Voltage stability refers to "*the ability of a power system to maintain steady voltages at all buses on the system after being subjected to a disturbance from the initial operating condition*" (IEEE-CIGRE, 2004). Consistent with the clause S5.1.8 of the NER, TasNetworks must maintain stable voltage control following the most severe credible contingency event or any protected event.

[4] SO_OP_3715 - Power System Security Guidelines (aemo.com.au)

Overview of the George Town Transmission Network

Figure 1 provides an overview of TasNetworks' transmission network supplying the George Town area.

George Town Substation supplies load in and around George Town and Bell Bay. It provides the connections to load and generator customers and Basslink, the HVDC interconnector which links the Tasmanian and Victorian networks.

George Town Substation is supplied from two 220 kV main corridors (i.e. Sheffield–George Town and Palmerston Hadspen–George Town) and these two corridors are interconnected through the Palmerston–Sheffield 220 kV line.

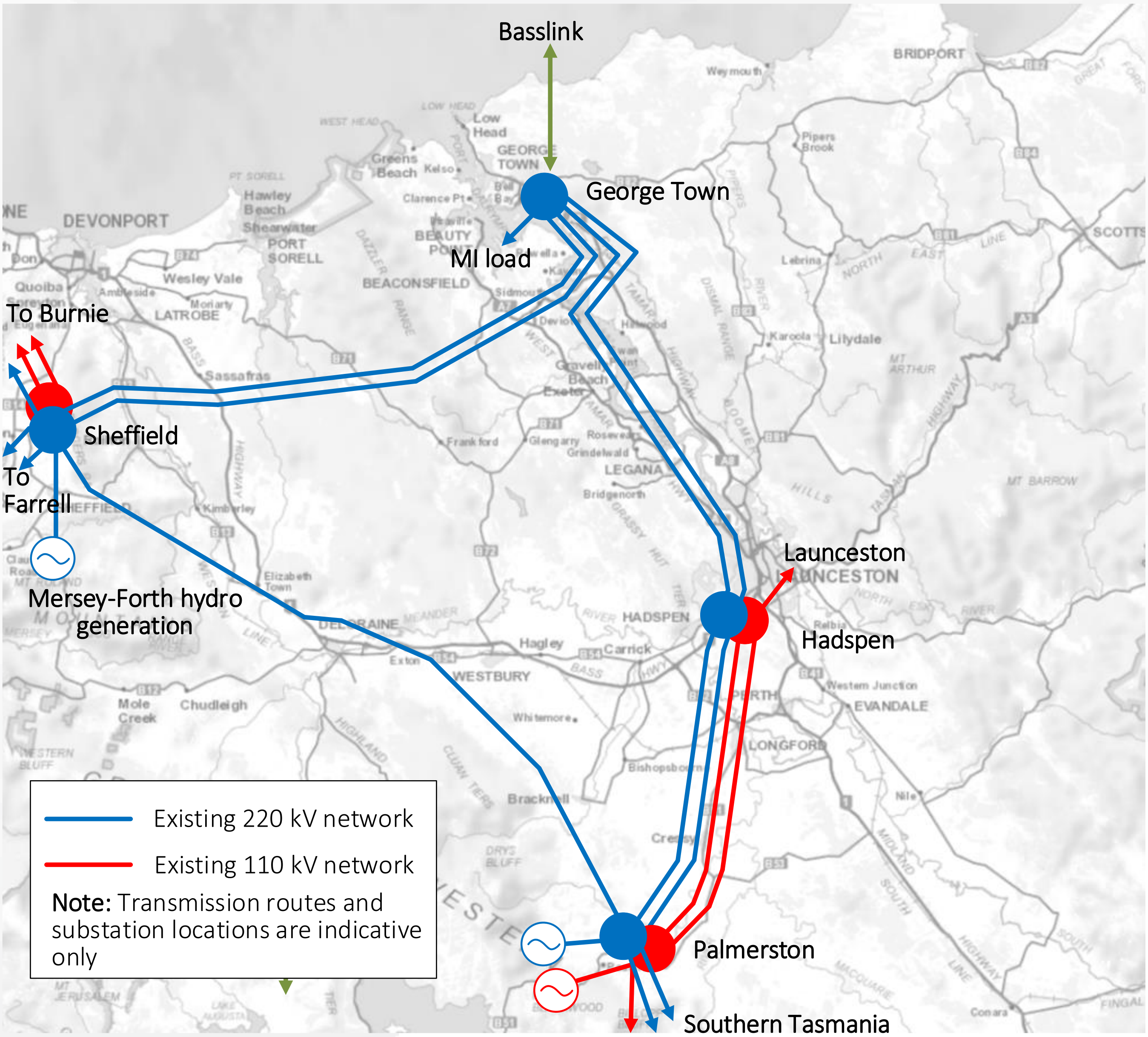

Figure 1 Network supplying the George Town area

The capability of the transmission network to supply George Town is limited by the Palmerston–Sheffield–George Town–Hadspen 220 kV transmission loop.

With respect to the Regulation 5(iii) of the NPR described above, George Town Substation load has historically remained below 60% of the Tasmanian regional load. This means that currently, loss of all load connected to George Town substation would not be classified in a black system event.

However, with the addition of 210 MW load, the maximum percentage of George Town load is capable of reaching the 60% threshold. At this point, the loss of all load connected to George Town Substation becomes a black system event.

To maintain healthy voltages during normal operation, and to ensure the network voltages remain stable during disturbances, TasNetworks currently deploy network constraints and local reactive support (capacitor banks) at George Town Substation, along with contracted network services to ensure minimum fault levels are maintained.

Figure 2 provides an overview of George Town substation and surrounding infrastructure and easements.

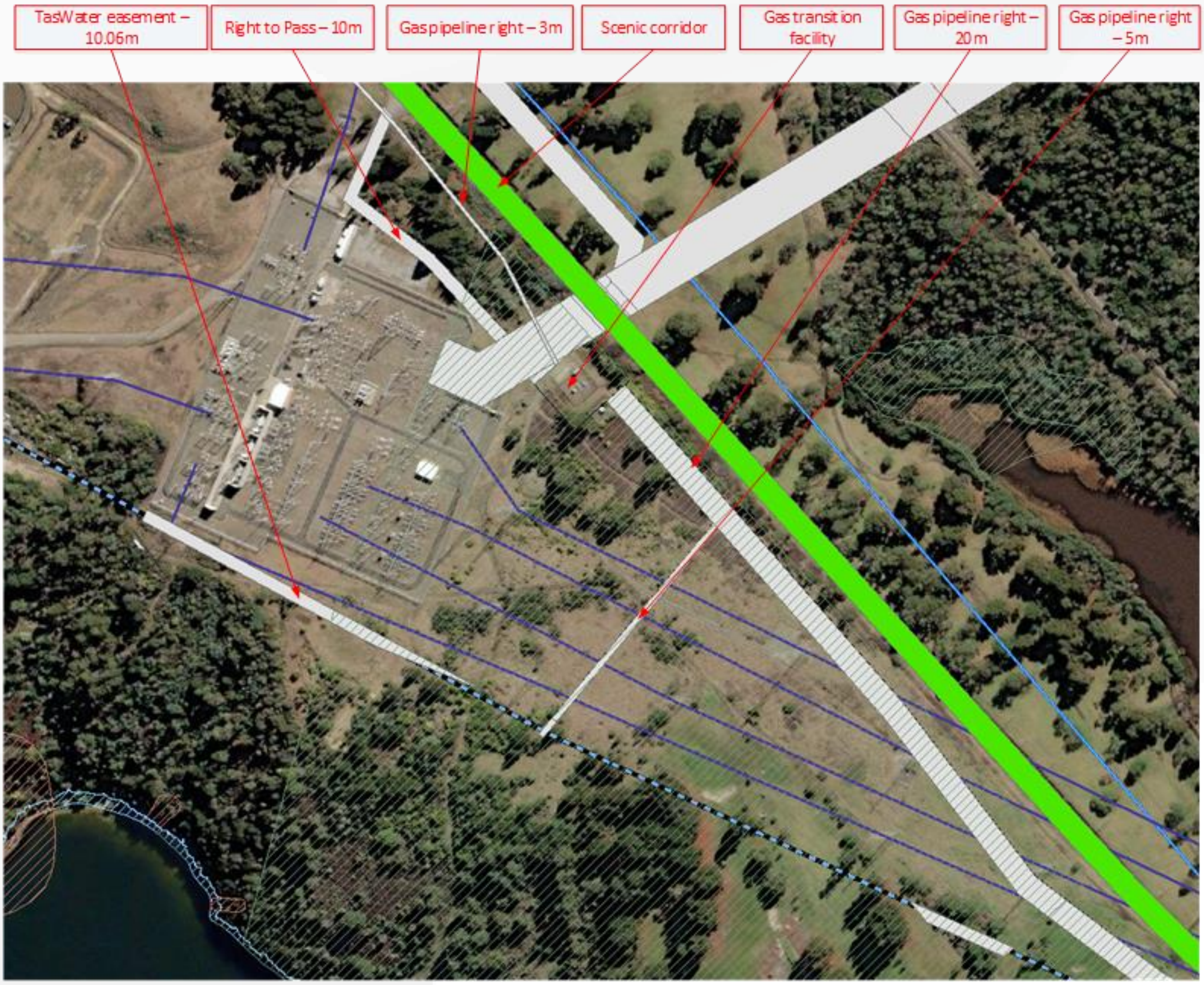

Figure 2 Layout of George Town substation

George Town Substation site presents potential challenges from the perspective of substation augmentation and transmission circuit ingress/egress due to the relatively high volume of existing overhead/underground connections at 220kV, 110kV and 22 kV.

Description of the Identified Need

Single element failure network risk

If TasNetworks were not to undertake any actions, and sufficient new load eventuates in George Town, we will not meet our obligations under the NPR. Specifically, the loss of a single asset (such as a network transformer) could result in a loss of load to system that is capable of being large enough to be classified as a system black condition.

Under the “do-nothing” base case, following connection of 210 MW of new load at George Town Substation, the Tasmanian power system would be at risk of system black event should a single asset failure occur, resulting in de-energisation of all load at the substation.

The risk of system black associated with George Town Substation can be assessed by comparing the 18 June 2022 transformer fire at Dapto 330 kV / 132 kV Substation in New South Wales. As a result of the fire, a large smoke plume from the blaze affected nearby Wollongong and Unanderra, with flights at nearby Shellharbour Airport delayed[5]. An EnergyAustralia media statement reported that the smoke plume caused the nearby Tallawarra power station to be disconnected for approximately 2 hours[6]. Tallawarra power station (435 MW) is situated approximately 2.5 km away and is connected to rest of the network through Dapto Substation. The severity of the fire is further illustrated in Figure 3.

Figure 3: Photos of Dapto Substation fire[7]

A comparison of George Town and Dapto substation sites is shown in Figure 4.

[5] Fire engulfs major substation south of Sydney, with one transformer fully alight - ABC News
[6] Media Statement on Transgrid's fire at Dapto substation | EnergyAustralia
[7] Power station fire still burning but blaze is 'contained' (9news.com.au)

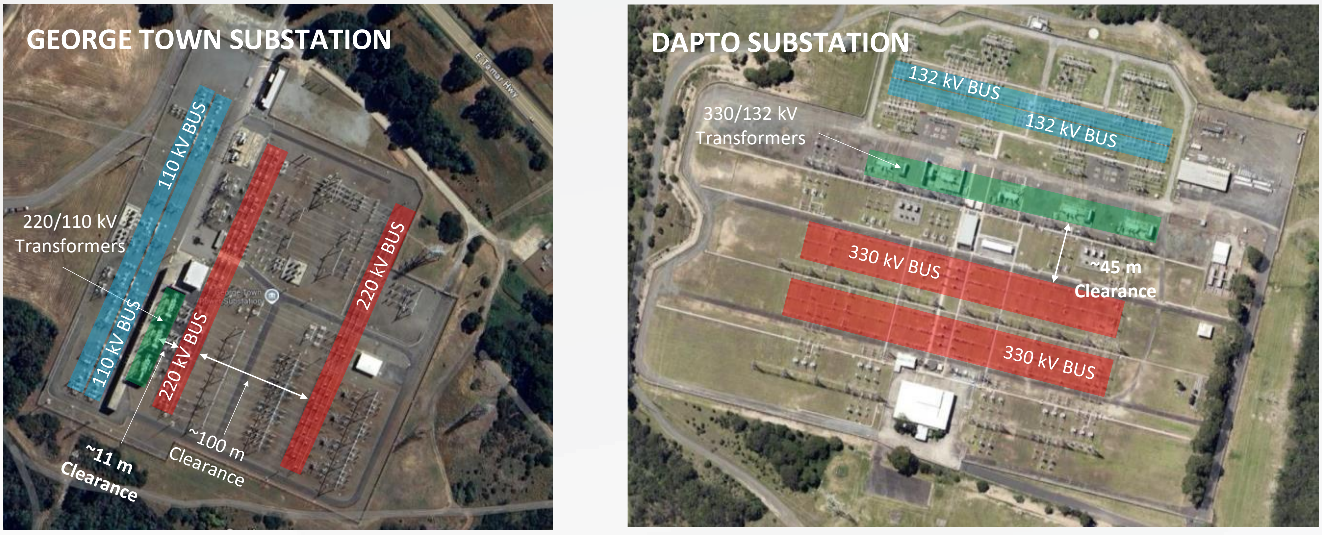

Figure 4: View of George Town and Dapto substations

George Town Substation has firewalls for the 220 kV/110 kV transformers, however these may not be sufficient to fully contain the smoke, ashes and heat spreading to other equipment. The risk at George Town Substation is heightened by the lower physical distances between transformers and other parts of the substation such as the 220 kV busbar, with risk of fire affecting other equipment. Limited access to the site to control the fire also contributes to higher restoration time.

For comparison purposes, the Dapto and George Town substation single line diagrams are shown in Figure 5. Dapto Substation has sectionalisers installed for both 330 kV and 132 kV busbars, with the network transformers connected to the 132 kV bus via a double breaker arrangement.

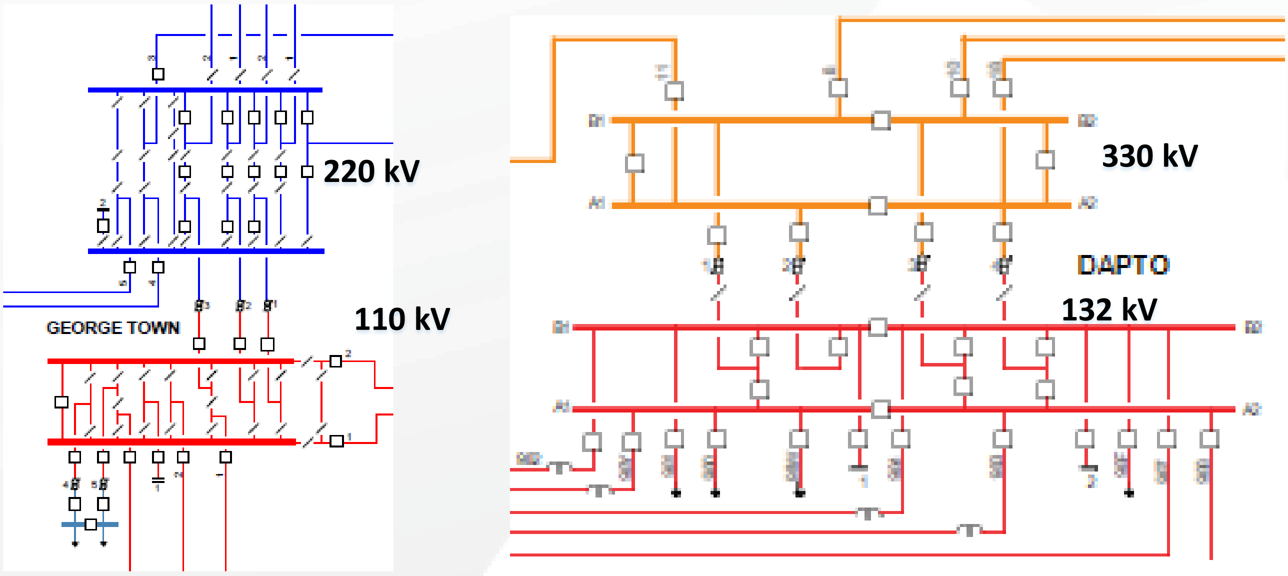

Figure 5: Single line diagrams of George Town and Dapto substations

George Town 220 kV switchyard has two 220 kV buses, partially configured with breaker and half arrangement and no bus sectionalisers. As such, George Town Substation has lower operational flexibility compared to Dapto Substation.

At George Town, if either 220 kV bus is taken out of service, a failure of the remaining bus would result in loss of supply to the substation. Bus failure can occur due to breaker failure or human error, which is a heightened risk during planned outage works.

The above mentioned asset failure events (i.e transformer fire or bus failure) in which all of George Town load is lost increases the risk of a further non-compliance event, whereby 3,000 MWh of unserved energy results from a single element failure (as defined in NPR clause 5.(1)(a)(v)).

The risk of exposure increases with additional load connections, in that a relatively shorter restoration time is required to avoid non compliance.

For the existing network, a 6.6 Hr outage will lead to non-compliance with the 3,000 MWh limit. With George Town substation load increased to just below the 60% threshold, this restoration time is reduced to 4.5 Hrs.

In summary, single asset failure events, whether the result of a transformer fire, or unplanned bus outage, are capable of resulting in a system black event.

With respect to the NPR, an additional 210 MW load requires a reliability corrective action to ensure compliance with the minimum network performance requirements. An indicative solution to reduce the impacted load at George Town includes measure such as upgrades to substation operational security within the substation and the creation of a new supply point in the region.

Voltage stability

One of the contributing factors leading to a system black event is widespread and severe voltage instability leading to voltage collapse. The network is designed and operated such that voltages remain within acceptable operating ranges during normal operation and recover following disturbances.

With respect to the NPR, single asset failure events, such as a transmission line or tower failure, are capable of causing voltage disturbances, that if not managed, could result in a system black event.

The requirements for steady state operation, and the stability criteria for transient and oscillatory behavior of voltage are defined under Chapter 5 of the NER.

To ensure sufficient voltage support is available during the most onerous post-contingent operating conditions, S5.1.8 states that TasNetworks is subject to the requirement “that the margin (expressed as a capacitive reactive power (in MVAr) must not be less than one percent of the maximum fault level (in MVA) at the common connection point”[8].

Reactive margin provides an indication of the stability of the network at George Town, to ensure that the voltage waveform will remain stable following a disturbance.

The maximum three-phase fault level of 4,877 MVA has been computed for George Town 220 kV substation with a corresponding standard reactive margin (i.e. a reactive surplus) requirement of 50 MVAr.

The existing network experiences challenges in meeting this requirement during conditions of peak loading and high Basslink export levels. As new load connects at George Town, management of voltage stability is necessary to ensure secure operation of the power system can be maintained over a wide range of network operating conditions. Voltage stability can be maintained through various solutions, such as:

- Installation of local devices that provide reactive power compensation;
- contracting of reactive support services from generators in the network;
- Augmentation of transmission network; and/or
- Imposition of network constraints

These solutions range in both complexity and expense, with impacts to the operation of the network and the energy market.

Assumptions underpinning the identified need

Demand Forecast

This RIT-T has been initiated in response to forecast demand growth in George Town, driven by large scale hydrogen proposals seeking to establish new processing facilities in the Bell Bay region.

Under the Green Energy Export Scenario, AEMO’s 2024 Electricity Statement of Opportunities (ESOO) indicates significant hydrogen production in Tasmania is forecast towards the end of the 2024-2029 regulatory control period and into the beginning of the 2029-2034 period, totalling approximately 4.68 TWh of annual energy consumption, or 560 MW at 95% capacity factor operation.

TasNetworks is aware of over 500 MW of new publicly announced hydrogen projects in the Bell Bay area. Based on discussion with the key stakeholders and proponents, TasNetworks considers it probable that at

[8] “National Electricity Rules - version 205”, Australian Energy Market Commission, 2024.

least 300 MW of new load will connect to the transmission network in George Town during the 2024-2029 regulatory control period.

Reactive Power Requirements

Owing to the absence of regularly utilised generation connected directly at George Town, connected load at the substation requires bulk power transfer through two key 220 kV transmission corridors to meet the supply requirements: Palmerston-Hadspen-George Town and Sheffield-George Town double-circuit corridors at times when Basslink is exporting.

The remoteness of generation from George Town inhibits the effectiveness of reactive support procured from Tasmania's generation fleet to support voltage in the North of the state.

Figure 6 shows an example of the available reactive margin at George Town following the loss of a major 220 kV transmission line. Without the application of network constraints, this scenario results in an insufficient reactive margin at George Town (approximately 25 MVAr or 0.5% of the maximum 3 phase fault level).

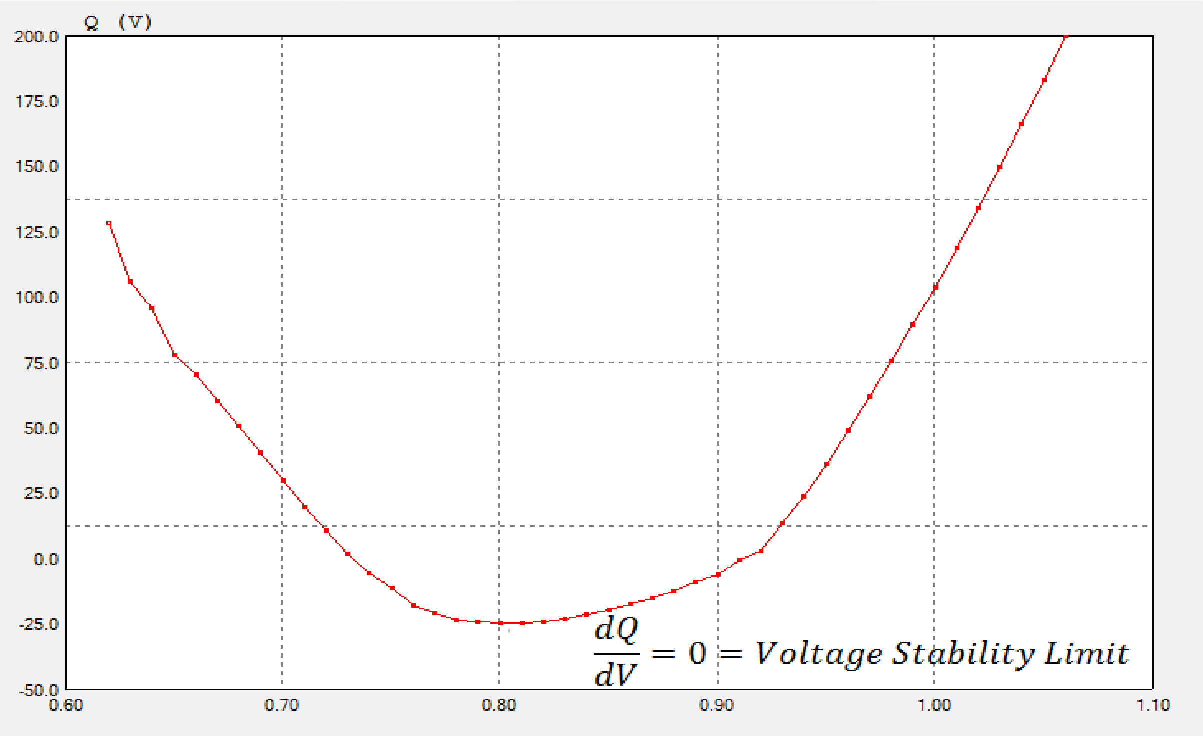

Figure 6: Reactive Margin characteristic at George Town substation

Voltage stability is currently managed by application of tripping schemes and network constraints which address post contingent voltages and reactive reserve margin. Any additional load in the George Town area will increase the extent to which constraints are applied to maintain power system security.

Voltage stability studies conducted by TasNetworks in 2024 indicate that without constraining Basslink export, approximately 500 MVAr of additional reactive support would be required to support 300 MW of additional new load at George Town.

The reactive power requirements at George Town are projected to increase continuously as load increases.

Characteristics of hydrogen loads

For new hydrogen loads connecting to George Town, voluntary load reduction is expected to be limited by the economic operating model for large scale production. Hydrogen electrolysers are flexible (adaptable) loads, however this flexibility would be prioritised to reduce consumption at peak times. The 60% NPR condition occurs most often when the state demand is low and therefore the energy prices are assumed as also low.

The Integrated System Plan (ISP) considers new hydrogen loads as an energy purchaser (i.e., hydrogen loads are price responsive). TasNetworks' market simulation studies conducted using the ISP model shows significant variations in the load from one load block to another load block. That means rapid changes in active power requirements can be observed in the future system when the loads are price responsive. If the active power requirements vary rapidly, the reactive power demand also varies accordingly to maintain the voltage. Therefore, dynamic reactive support is needed to accommodate new loads providing rapid changes in reactive power demand.

For the purpose of this RIT-T, the proposed augmentation option has been developed for a connection of 300 MW, which corresponds with the first expected tranche of new hydrogen load. This value exceeds the trigger threshold of 210 MW that results in possible non-compliance with the NPR for single element load loss event, and requires the first discrete stage dynamic reactive support, which would be of similar scale for a range of load increases between 210 – 500 MW.

Credible Options

This section describes the options we have investigated to address the need, including the scope of each option and the associated costs.

A credible option is an option that:

- addresses the identified need. That is, achieves the objective that TasNetworks is seeking to achieve by investing in the network;
- is commercially and technically feasible; and
- can be implemented in sufficient time to meet the identified need.

TasNetworks must consider all options that it could reasonably classify as credible options for meeting the identified need, without bias to energy source, technology, ownership and whether it is a network or non-network option. Importantly, TasNetworks has assumed the following credible options are capable of meeting our minimum network performance requirements following connection of 300 MW of new load at George Town.

The Base Case

Consistent with the RIT-T requirements, the RIT-T assessment will compare the costs and benefits of each option to a base case 'do nothing' option.

The base case is the (hypothetical) projected case if no action is taken, i.e.:

> *"The base case is where the RIT-T proponent does not implement a credible option to meet the identified need, but rather continues its 'BAU activities'. 'BAU activities' are ongoing, economically prudent activities that occur in absence of a credible option being implemented"*

Under the base case scenario, if the load increases at George Town by 210 MW, or more, it is possible for the total George Town load to equal 60% of the state demand, resulting in non-compliance with the NPR.

TasNetworks does not consider this scenario to be acceptable as the mandatory compliance requirements with the rules are not met.

Simultaneously, increased loading at George Town will decrease the voltage stability of the network, requiring the procurement of dynamic reactive support from existing generators (if available) and / or imposition of network constraints to ensure secure operation of the network.

While this is not a situation we plan to encounter, and this RIT-T has been initiated specifically to avoid it, the assessment is required to use this base case as a common point of reference when estimating the net benefits of each credible option.

TasNetworks is not intending to quantify the full extent of the expected involuntary load shedding under the base case, as identified options will address the minimum network performance requirements and avoid largely the same amount of unserved energy, i.e., quantifying the full extent of avoided involuntary load shedding under each option will not assist in identifying the preferred option under the RIT-T.

Option 1

Option 1 is the only identified credible option to address the identified need in this RIT-T. It reflects the indicative solution outlined as part of the George Town Network Upgrade included in TasNetworks 2024-2029 revenue proposal.

Under this option, TasNetworks:

- reconfigures the existing George Town Substation and constructs a new substation nearby; and
- installs additional reactive support in George Town.

Option	Description	Estimated cost	Proposed commissioning date
1	• Reconfigure the existing George Town 220 kV substation and construct a new substation. • Install 550 MVAr of reactive power compensation (combination of STATCOMs and capacitors	• $83 million for substation works • $80[9] million for reactive support	2028 - 2032

[9] Based on technical studies undertaken during 2024, TasNetworks has identified greater reactive compensation requirements at George Town in response to new load than previously considered by TasNetworks as part of the Revenue Reset process. Costs are indicative based on the AEMO cost database v2.0 and are subject to changes based on final design specification

Voltage assessment studies indicate that between 500-550 MVAr of reactive power compensation is required to support 300 MW of new load. This reactive compensation would comprise a combination of dynamic capability and static reactive support.

Figure 7 shows the existing 220 kV George Town Substation with proposed re-arrangements and limited space available for new connections.

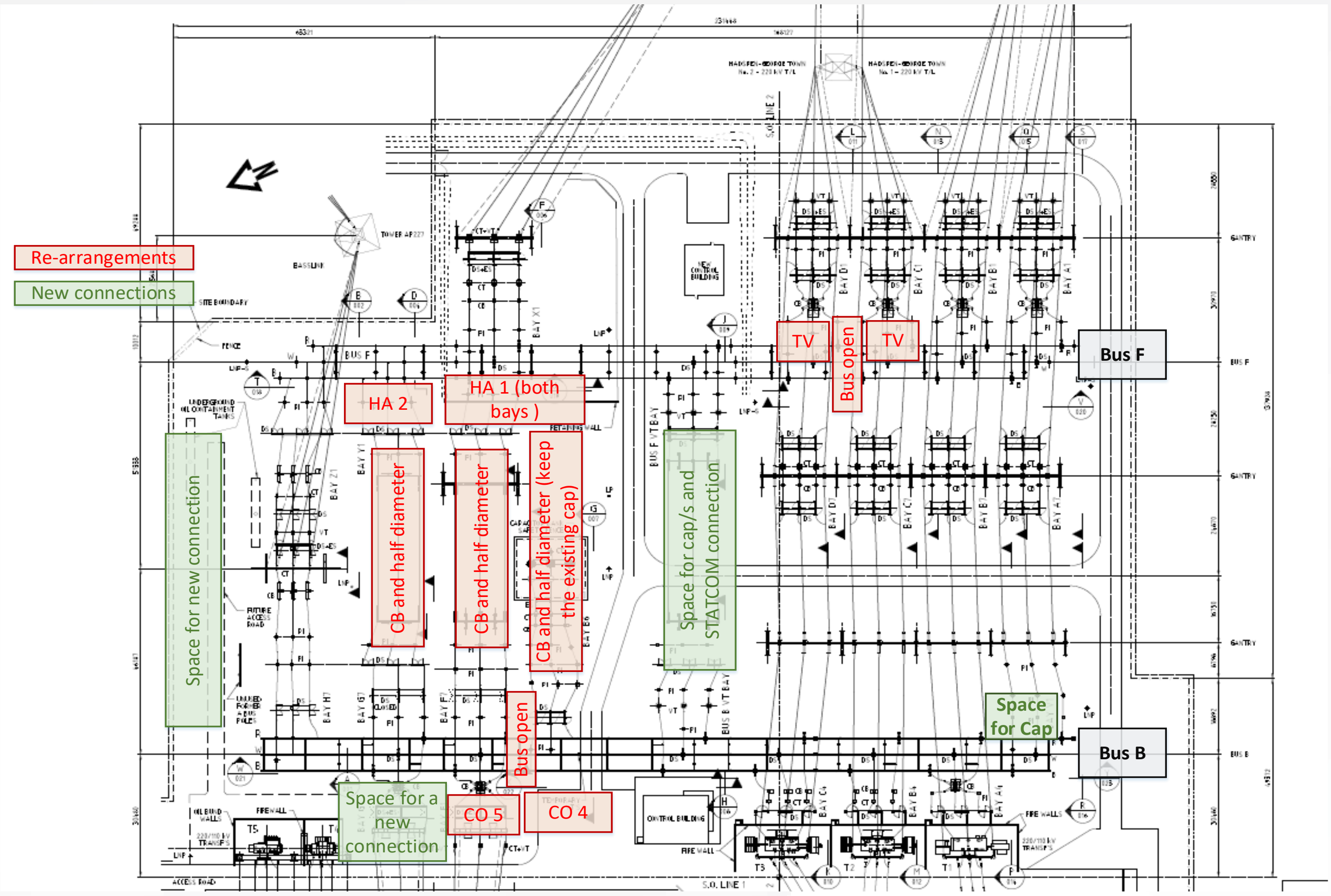

Figure 7: Map of George Town substation with proposed augmentations under Option 1

The proposed augmentation works apply the following change to George Town 220 kV switchyard:

- Segmentation of the 220 kV bus into four sections to reduce affected elements during fault events;
- Re-allocation of connecting 220 kV transmission corridors to Sheffield and Hadspen to opposite ends of the 220 kV switchyard;
- Extension of the 220 kV buses to accommodate 2 additional diameters at either end of the switchyard;
- Establishment of a separate, 220 kV switchyard at George Town to provide a diverse supply to load connections;
- Commissioning of dynamic reactive support equipment at George Town or co-located site; and
- Conversion of all 220 kV diameters to breaker and half configuration.

Some optionality is assumed for the works delivered under this option, driven by factors including:

- Physical location and direction of approach of new load connections;
- Exact sizing of new load; and

- Optimal combination of dynamic / static reactive support

The project has an indicative cost estimate of $163 million ($80 million for reactive support, $83 million for substation works). The estimated annual operating and maintenance costs are 2% of the capital cost. Consistent with the RIT-T Guidelines, for projects valued at over $100 million, TasNetworks must apply the cost estimate classification system published by the Association for the Advancement of Cost Engineering (AACE). TasNetworks will develop all credible options identified in the Project Assessment Draft Report to an appropriate cost estimation level.

The estimated construction time and commissioning date is approximately 3 years to design and construct.

This RIT-T is based on new load commitment of 300 MW or more within the 2024-2029 regulatory period, placing the approximate commissioning date between 2028-2032.

Non-Network Options

A key focus of the RIT-T is to elicit solutions from non-network proponents and to assess these against 'traditional' network solutions. Non-network options may:

- address the identified need on a stand-alone basis; or
- form part of a credible option along with network elements (e.g. reduce the required scope or enable the efficient deferral of network options).

Efficient deferral occurs when the annual cost of the non-network option is less than the Net Present Value benefits of deferring capital expenditure. If this is the case, a credible option should be formed comprising a non-network option followed by a network option.

Required technical characteristics of non-network options

This section of the report sets out the characteristics that a non-network solution would need to exhibit to contribute to meeting the identified need.

Compliance with the NPR single contingency event case requires that connected load at George Town substation that is exposed to a single outage amounts to no less than 60% of the total state load.

Non network solutions would require the following characteristics

- Provide behind the meter compensation or curtailment of both real and reactive power consumption of connected load; and
- Operate in a variable manner depending on the load profile of George Town and the remaining network.

For voltage stability, demand management solutions would need to offset the impacts of new load on the network, such that stability of the network following a credible disturbance remains within acceptable requirements under the rules. Stability will be determined / quantified by steady state and dynamic studies (i.e Q-V and voltage recovery analysis).

An economic assessment will determine whether such solutions present a net benefit when compared against the network constraints that would otherwise need to be imposed / further applied to manage the issue if the proposed network solution is not implemented (dynamic reactive support).

Material Inter-regional Impact

We have considered whether the credible option listed above is expected to have material inter-regional impact. A "material inter-network impact" is defined by the NER in the following terms:

"A material impact on another Transmission Network Service Provider's (TNSP's) network, which may include (without limitation):

a) the imposition of power transfer constraints within another TNSP's network; or

b) an adverse impact on the quality of supply in another TNSP's network."

In determining whether a proposed transmission augmentation can be expected to have a material inter-network impact, the AEMO screening test can be applied which describes the following considerations:

- an increase in fault level of more than 10 MVA at any substation in another TNSP's network;
- a change in power transfer capability between transmission networks or in another TNSPs network of more than the minimum of 3% of maximum transfer capability and 50 MW;

- there is a significant change to voltage or any power quality metrics at the network boundary; and
- the investment does not involve either a series capacitor or modification in the vicinity of an existing series capacitor.

The indicative identified option considered for this RIT-T will have a material interregional impact, on the basis they will directly result in the alleviation of interconnector constraints between Tasmania and Victoria, particularly during periods of export.

There are no directly detrimental impacts to the Victorian network expected to be brought about by the application of any of the proposed options of this project.

Options Considered But Not Progressed

TasNetworks considered whether other network options could address the identified need.

Voltage stability studies undertaken for George Town included a consideration of synchronous condenser (syncon) technologies to provide dynamic reactive support. It was observed that for some contingency conditions, syncons were not capable of response times compared against static var compensator (STATCOM) technology and not suitable to maintain secure and unconstrained operation of the network.

Materiality of market benefits

The NER requires that TasNetworks consider different classes of market benefits that could be delivered by a credible option. Furthermore, the NER requires that TasNetworks consider all classes of market benefits as material unless it can provide reasons why:

- a particular class of market benefit is likely not to materially affect the outcome of the assessment of the credible options under the RIT-T; or
- the estimated cost of undertaking the analysis to quantify the market benefit is likely to be disproportionate to the scale, size and potential benefits of each credible option being considered.

Although dependent on the final credible options that TasNetworks models, at this stage we have made a preliminary assessment on the materiality of market benefits for this RIT-T.

Market benefits considered material

Provision of dynamic reactive support to stabilise the network during disturbances, alleviates operating constraints both in the Tasmanian network and for the Basslink interconnector, allowing greater flexibility to operate the network to facilitate efficient market participation.

At this stage, TasNetworks considers changes in fuel consumption arising through different patterns of generation dispatch to be the primary material benefit for this RIT-T assessment and the reduction in the duration and severity of network load constraints.

Maintaining voltage stability at George Town allows efficient and consistent export of power across Basslink. TasNetworks expects this would allow low cost Tasmanian generation to displace higher cost mainland fuels than under the base case.

If required, TasNetworks would estimate this market benefit by:

- Developing the future state NEM market condition (i.e., Victorian spot price profile, fuel costs, generation profile, inter-regional energy flows and network demand);
- Developing the future state Tasmanian network profile based on state-wide generation patterns, network configuration and short-medium term demand forecast. Inter-regional flows will be derived for the Basslink interconnector based on the co-dependency between Tasmanian and Victorian market profile;
- Establishing the baseline condition in terms of net market revenue and operating costs with a future projection over a specified timeframe;
- Evaluating the relative economic benefits of implementing dynamic reactive support at George Town to address the network constraints due voltage collapse issues in future market; and
- Evaluating the relative benefits of implementing services offered by dynamic reactive devices.

Given only a single benefit category linked to generation dispatch is material, TasNetworks has not yet determined whether market modelling is a proportionate expense and may quantify changes in fuel consumption through a more appropriate mechanism.

Market benefits not considered material

TasNetworks does not expect any other market benefit categories to be material for this RIT-T. In particular, TasNetworks considers all credible options will address TasNetworks minimum network performance requirements and therefore address the same level of reliability risk associated with the base case.

- **changes in voluntary and involuntary load curtailment**: As explained above, although addressing the need may result in a reduction in unserved energy compared to the base case, this is expected to be the same for all credible options assessed (and so will not be material to the RIT-T outcome). The base case is not a credible option under a reliability corrective action RIT-T.
- **changes in costs for parties, other than the RIT-T proponent**: no credible options are expected affect the timing of new plant, capital costs or operational and maintenance costs for other parties.
- **differences in the timing of unrelated network expenditure**: no credible option is expected to impact the timing of other network expenditure. Although an option may be capable of contributing to an alternative need (for example by providing a system strength service) this is expected to be similar across all options. TasNetworks will reassess this claim in the PADR.
- **changes in ancillary service costs**: the credible options considered are equivalent in terms of the voltage control service they provide and, as such, none are expected to have a relative impact on ancillary service costs.
- **competition benefits**: due to the localised nature of the issue, TasNetworks does not consider that any of the credible options will materially affect competition between generators.
- **option value**: option value is likely to arise where there is uncertainty regarding future outcomes, the information that is available in the future is likely to change and the credible options considered by the TNSP are sufficiently flexible to respond to that change. Consistent with the TRHAP, TasNetworks expects load to develop in discrete stages in George Town, rather than steadily increase over time. As such, although the actual quantum of new load is unknown, we do not expect material option value in this RIT-T assessment.

- **changes in network losses**: the credible options will be installed at or near the areas where the services will be utilised, and the effectiveness of the solution is dependent on these locations. There are not expected to be any material differences in network losses between options.
- **changes in Australia's greenhouse gas emissions**: We do not expect any of the credible options to materially impact greenhouse gas emission levels.

Next Steps

TasNetworks is seeking stakeholder submissions on the various issues and credible option that have been presented as part of this PSCR.

Stakeholders should mark submissions as 'Confidential' if they do not wish them to be made publicly available. In the case of confidential submissions, TasNetworks may explore with the submitting party if a redacted or public version can be offered. Irrespective of the classification, we reserve the right to discuss the content of any submission with the Australian Energy Regulator and AEMO for the purposes of progressing the RIT-T through to conclusion, noting that all parties will be made aware of the confidential nature of any material prior to such discussions.

In accordance with the RIT-T Guidelines, we intend to publish a PADR within 12 months of the PSCR consultation period ending. Appendix B provides a simplified flowchart of the RIT-T process expected to be followed for this activity. The PADR will include a summary of submissions received to this consultation report as well as responses and actions to any issues raised.

The PADR will also include:

- A description of which credible options have been assessed.
- Indicative costs of each credible option as informed by feedback to this PSCR (noting that commercially sensitive information will not be made public).
- A description of the methodologies used to quantify costs and benefits.
- A net present value analysis for each credible option.
- A proposed preferred option taking into account the net present value analysis as well as any other considerations deemed appropriate and allowable within the RIT-T framework.

TasNetworks is seeking written submissions to this PSCR over a 13-week period ending at 28 February 2025.

For further information, please contact:

Matthew Clarke

Leader Large Regulated Investment

Tasmanian Networks (TasNetworks)

Email submissions or queries in relation to this PSCR can be sent directly to:
regulation@tasnetworks.com.au

Appendix A Regulatory compliance

This appendix sets out a checklist which demonstrates the compliance of this PADR with the requirements of the National Electricity Rules version 216.

Rules clause	Summary of requirements	Relevant section(s) in PADR
5.16.4(b)	A RIT-T proponent must prepare a report (the assessment draft report), which must include:	
	1) a description of the identified need.	Description of the Identified Need
	2) the assumptions used in identifying the identified need (including, in the case of proposed reliability corrective action, why the RIT-T proponent considers reliability corrective action is necessary);	Assumptions underpinning the identified need
	3) the technical characteristics of the identified need that a non- network option would be required to deliver, such as: (i) the size of load reduction of additional supply; (ii) location; and (iii) operating profile;	Required technical characteristics of non-network options
	4) if applicable, reference to any discussion on the description of the identified need or the credible options in respect of that identified need in the most recent Integrated System Plan;	n/a
	5) a description of all credible options of which the RIT-T proponent is aware that address the identified need, which may include, without limitation, alterative transmission options, interconnectors, generation, demand side management, market network services or other network options;	Credible Options
	6) for each credible option identified in accordance with subparagraph (5), information about: i. the technical characteristics of the credible option; ii. whether the credible option is reasonably likely to have a material inter-network impact; iii. the classes of market benefits that the RIT–T proponent considers are unlikely to be material and reasons why they are unlikely to be material; iv. the estimated construction timetable and commissioning date; and	Credible Options *and* Materiality of market benefits

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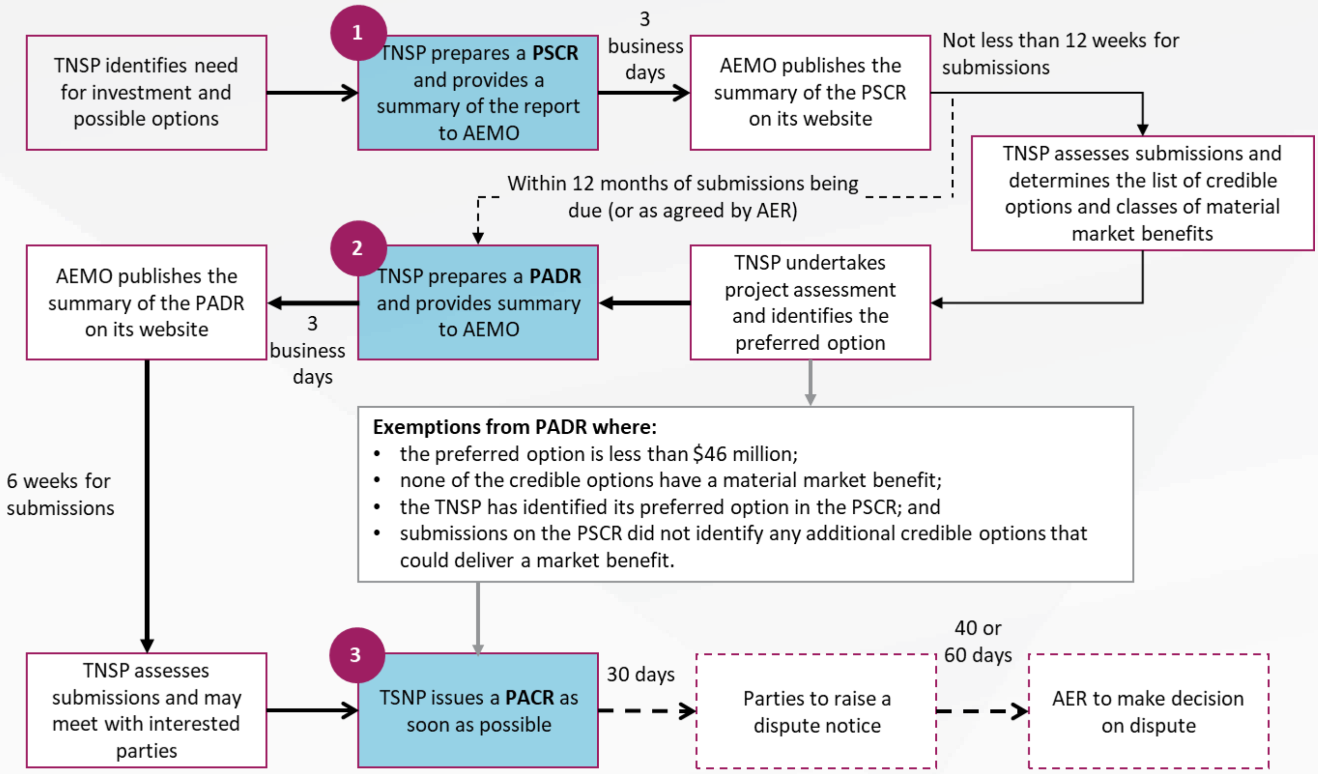
v. to the extent practicable, the total indicative capital and operating and maintenance costs.

Appendix B


TNSP identifies need for investment and possible options
1
TNSP prepares a **PSCR** and provides a summary of the report to AEMO
3 business days
AEMO publishes the summary of the PSCR on its website
Not less than 12 weeks for submissions
TNSP assesses submissions and determines the list of credible options and classes of material market benefits
Within 12 months of submissions being due (or as agreed by AER)
2
TNSP prepares a **PADR** and provides summary to AEMO
TNSP undertakes project assessment and identifies the preferred option
AEMO publishes the summary of the PADR on its website
3 business days
Exemptions from PADR where:
• the preferred option is less than $46 million;
• none of the credible options have a material market benefit;
• the TNSP has identified its preferred option in the PSCR; and
• submissions on the PSCR did not identify any additional credible options that could deliver a market benefit.
6 weeks for submissions
TNSP assesses submissions and may meet with interested parties
3
TSNP issues a **PACR** as soon as possible
30 days
Parties to raise a dispute notice
40 or 60 days
AER to make decision on dispute

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