Service constraints at Warragul (WGL) Zone Substation

RIT-D Stage 1: Non-network options report

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Table of Contents

1 Executive Summary

AusNet Services is a regulated Victorian Distribution Network Service Provider (DNSP) that supplies electrical distribution services to more than 745,000 customers. Our electricity distribution network covers eastern rural Victoria and the fringe of the northern and eastern Melbourne metropolitan area.

As expected by our customers and required by the various regulatory instruments that that we operate under, AusNet Services aims to maintain service levels at the lowest possible cost to our customers. To achieve this, we develop forward looking plans that aim to maximise the present value of economic benefit to all those who produce, consume and transport electricity in the National Electricity Market (NEM).

Our planning approach includes the application of a probabilistic planning methodology, under which conditions often exist where some of the load cannot be supplied under rare but possible conditions, such as during extreme demand conditions or with a network element out of service. Where relevant, we also prepare, publish, and consult on a regulatory investment test for distribution (RIT-D), which further helps ensure all credible options are identified and considered, and the best option is selected.

This non-network options report is stage one of the RIT-D consultation process to address the existing and emerging service level constraints in the Warragul (WGL) Zone Substation supply area. The report has been prepared by AusNet Services in accordance with the requirements of clause 5.17 of the National Electricity Rules (NER).

1.1 Identified Need

WGL commenced operation as a 66/22kV transformation station in 1962. Three 10/12.5MVA transformers were installed in 1962. A fourth 10/13.5MVA transformer was added in 1997 as a replacement for an existing 5/6.5MVA transformer, however this transformer was manufactured in 1965. A fifth 20/33MVA transformer was added in 2011. The 66kV switchyard was constructed in the 1960s, with the exception of an additional 66kV CB added in 2011 when the fifth transformer was installed. The 22kV switchyard was replaced by an indoor switchboard in 1997.

The physical and electrical condition of some assets has deteriorated, and they are now presenting an increasing failure risk.

The station has a 66kV ring bus arrangement, but is partially switched with the four 1960's vintage transformers switched as a single group, and a normally open isolator in place of a 66kV circuit breaker between the two 66kV line entries from YPS.

The key service constraints at WGL are:

- Security of supply risk presented by the switching of four of the transformers in a single group;
- Security of supply risks presented by increased likelihood of asset failure due to the deteriorating condition of the assets;
- Health and safety risks presented by a possible explosive failure of bushings on a number of the assets;
- Plant collateral damage risks presented by a possible explosive failure of bushings on a number of the assets;
- Environmental risks associated with insulating oil spill or fire;
- Reactive asset replacement risks presented by the increasing likelihood of asset failure due to the deteriorating condition of the assets; and

- Health and safety risks presented by asbestos containing cement sheets or electrical switch boards in the main building and switchyard.

1.2 Credible options

The potentially credible options that AusNet Services believes may be capable of meeting the identified need include:

1. Do nothing (counterfactual)
2. Retire one transformer
3. Retire one transformer and reduce residual risk through network support
4. Use network support to defer retirement and replacement
5. Replace four transformers with two transformers and replace capacitor bank
6. Replace four transformers with two transformers, replace the existing capacitor bank and install two new 66kV circuit breakers
7. Replace four transformers with four transformers and replace capacitor bank.

1.3 Submissions

AusNet Services invites written submissions on the matters set out in this non-network options report from Registered Participants, AEMO, interested parties, non-network providers and those registered on our demand side engagement register.

All submissions and enquiries should be directed to:

Fuji Dinh
Senior Engineer – Strategic Network Planning
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Email: ritdconsultations@ausnetservices.com.au

Submissions are due on or before 31st May 2021.

Submissions will be published on AusNet Services' website. If you do not wish to have your submission published, please clearly stipulate this at the time of lodging your submission.

1.4 Next steps

Following conclusion of the non-network options report consultation period, AusNet Services will, having regard to any submissions received on this non-network options report, prepare and publish a draft project assessment report (DPAR). AusNet Services intends to publish the DPAR by Q2 2021.

2 Introduction

The RIT-D is an economic cost-benefit test used to assess and rank potential investments capable of meeting the identified need. The purpose of the RIT-D is to identify the credible option that maximises the present value of net economic benefit to all those who produce, consume and transport electricity in the NEM (the preferred option).

This non-network options report is the first stage of the RIT-D consultation process in relation to the existing and emerging service level constraints in the WGL supply area. This report has been prepared by AusNet Services in accordance with the requirements of clause 5.17 of the NER.

This report:

- Describes the identified need that AusNet Services is seeking to address, in relation to the service level constraints in the WGL Zone Substation supply area.
- Outlines the assumptions made in identifying the need.
- Describes the options that AusNet Services considers could potentially address the identified need.
- Outlines the technical characteristics that a non-network option would be required to deliver to meet the identified need.
- Invites registered participants, AEMO, interested parties, non-network providers and persons on AusNet Services' demand side engagement register to make a submission on this non-network options report.

3 Background

3.1 Existing network

WGL is located approximately 100km south east of Melbourne and is the main source of supply for the suburbs of Warragul, Drouin, Longwarry, Bunyip, Darnum, Noojee and surrounding areas.

WGL supplies approximately 23,300 AusNet Services' customers. The load at WGL includes mostly residential with some farming, commercial and industrial loads. The Warragul zone substation area is in West Gippsland at an elevation of 143m above sea level. WGL has summer average maximum temperatures of 24°C, winter average minimum temperatures of 6°C with extreme temperatures reaching 44°C in summer and -5°C in winter. The average annual rainfall is 837mm in this area.

WGL is supplied at 66kV via two 66kV circuits that originate from Morwell Terminal Station (MWTS). These lines also serve YPS and MOE zone substations.

The location of WGL within the AusNet Services distribution network is as shown in Figure 1.

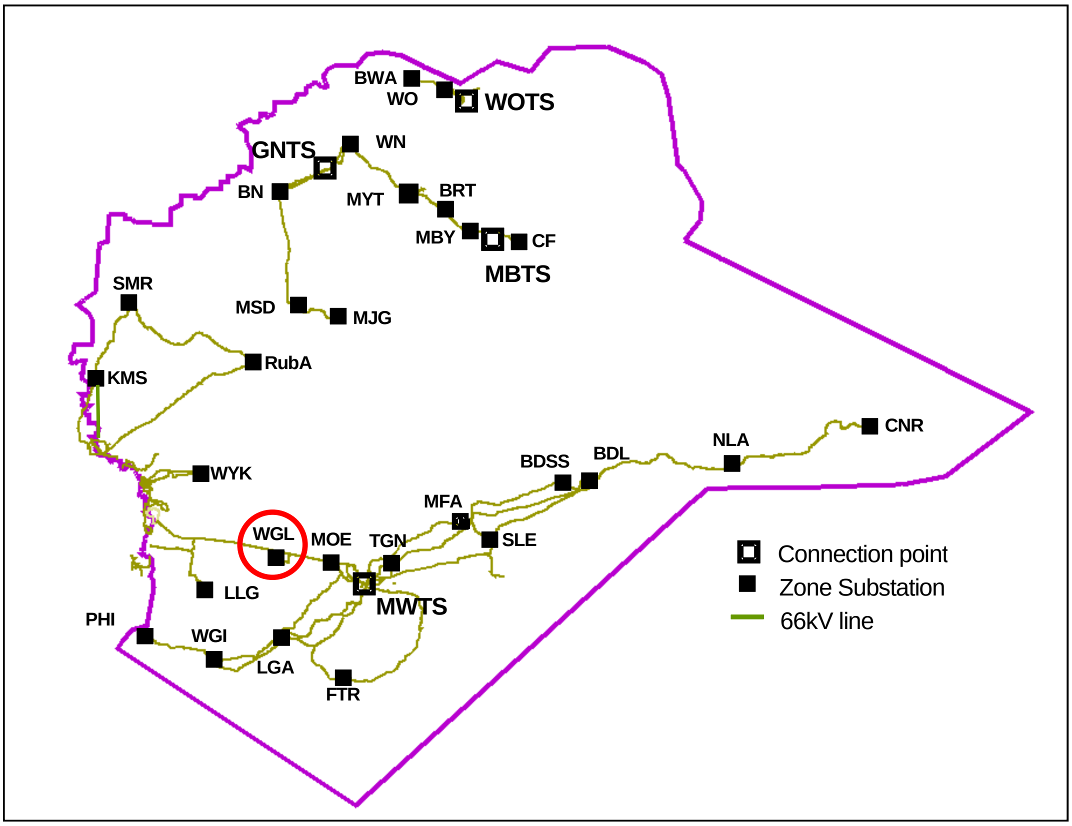

Figure 1: WGL location within AusNet Services distribution network

The configuration of primary electrical circuits within WGL is as shown in the single line diagram in Figure 2.

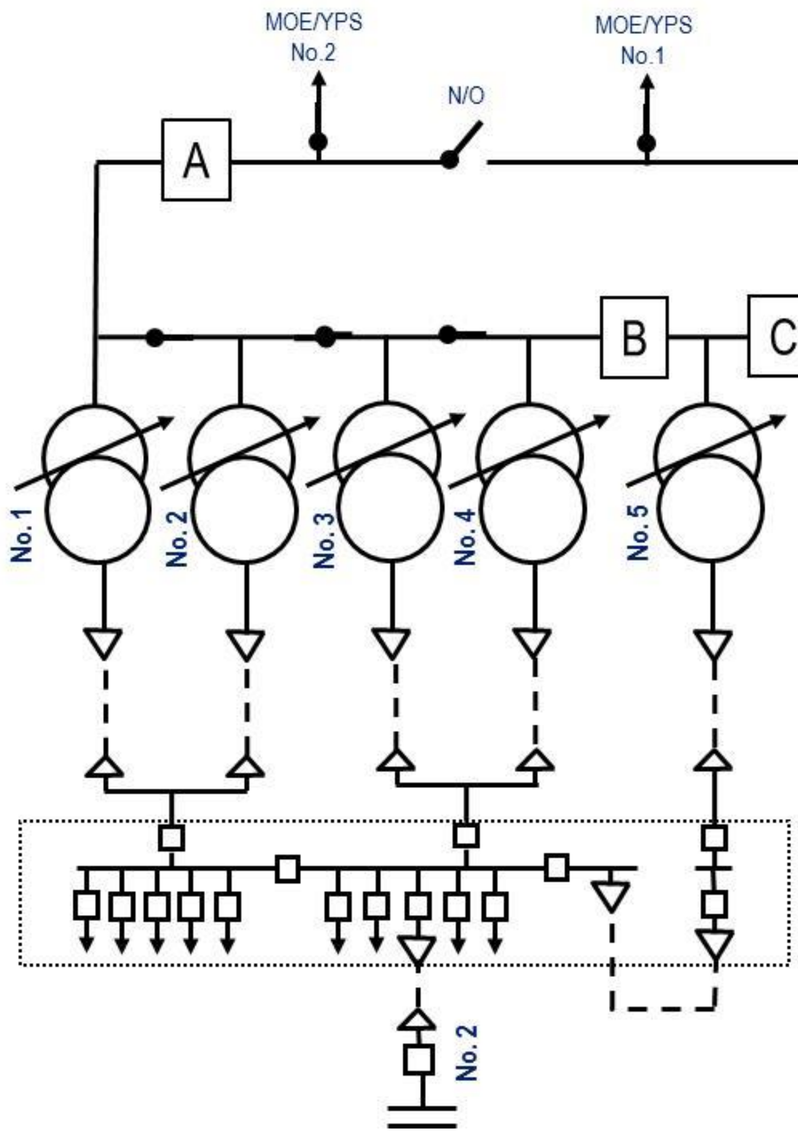

Figure 2: WGL Single Line Diagram

3.2 Customer Composition

WGL has nine 22kV feeders supplying AusNet Services' customers. Table 1 provides detail of the 22kV supply feeders.

Table 1: WGL feeder information

Feeder	Feeder Length (km)	Feeder description	Number of Customers	Type of Customers
WGL11	58	Summer peaking, short rural feeder	3,808	84% residential 5% commercial 1% industrial 10% farming
WGL12	325	Summer peaking, long rural feeder	3,501	75% residential 5% commercial 1% industrial 19% farming

Feeder	Feeder Length (km)	Feeder description	Number of Customers	Type of Customers
WGL13	150	Summer peaking, short rural feeder	3,899	90% residential 7% commercial 3% farming
WGL14	8	Summer peaking, urban feeder	1	100% commercial
WGL15	116	Summer peaking, short rural feeder	2,809	73% residential 18% commercial 1% industrial 8% farming
WGL21	227	Summer peaking, long rural feeder	4,813	88% residential 3% commercial 1% industrial 8% farming
WGL22	10	Summer peaking, urban feeder	1	100% commercial
WGL23	167	Summer peaking, short rural feeder	1,359	50% residential 17% commercial 3% industrial 30% farming
WGL24	423	Summer peaking, long rural feeder	3,116	64% residential 6% commercial 1% industrial 29% farming

The medium voltage feeders interconnect with medium voltage feeders from Pakenham, Moe and Leongatha Zone Substations but the distance to these stations and loading on these feeders means that only 3.4MVA of load is able to be transferred to these stations via 22kV feeders.

3.3 Zone Substation Equipment

3.3.1 Primary Equipment

WGL includes an air-insulated 66kV switchyard with eight 66kV buses separated by either bus-tie circuit breakers or isolators connected to two incoming 66kV lines from MWTS via YPS and MOE. CB “A” and CB “B” are minimum oil CB’s rated at condition C5.

There are two 22kV indoor switchboards. Bus 1 is connected to a bank of two 10/12.5MVA transformers via a single 22kV transformer CB. Bus 2 is connected to a bank of two transformers (1 x 10/12.5MVA and 1 x 10/13.5MVA) via a single 22kV transformer CB, and the newer 20/33MVA transformer via the Bus 2-3 bus tie CB. Nine 22kV feeders and one 6 MVAR and one 12 MVAR capacitor banks are connected to these 22kV busbars.

Transformation comprises one 10/13.5MVA 66/22kV transformer located at position No.1 manufactured by Wilson at condition C4, three 10/12.5MVA 66/22kV transformers located in the No.2, No.3 and No.4 positions manufactured by Asea rated at C4 and installed in the 1960’s, and one 20/33MVA 66/22kV transformer located in the No.5 position manufactured by Shihlin rated at C1 installed in 2011.

3.3.2 Secondary Equipment

The two incoming 66kV lines are YPS/MOE No.1 and No.2 Lines. YPS/MOE No.1 Line is protected by an ABB LZ31 distance protection of obsolete analogue electronic tyope as X protection and a GE L90 numerical current differential relay as Y protection. The former is being replaced with a modern numerical type current differential protection under a project in the prior EDPR period. YPS/MOE No.2 Line has X and Y protection that are both modern numerical relays.

The existing 66kV bus protection is an obsolete ABB RAKZB analogue electronic relay. This will be replaced by numerical X (SEL487) and Y (Siemens 7UT87) relays in a protection upgrade project in the prior EDPR period.

Auto Reclose(ARC) of 66kV CB's is presently handled by obsolete Group 2873 relays. Built in ARC functions in numerical line protection relays will replace existing ARC relays when the protection upgrade project is completed.

Duplicated X and Y CB failure protection are provided for 66kV CBs using numerical SEL551 and early generation digital 2C63 relays.

Protection for Transformers No.1, No.2, No.3 and No.4 are not duplicated. Transformers No.1, No.2 and No.4 are protected by first generation digital type relays KBCH120. Transformer No.3 is protected by electromechanical type D21SE2 relays. These relays will be replaced with duplicated X and Y biased differential protection of numerical type in the protection upgrade project. Modern numerical type biased differential relays are used for X and Y protection of Transformer No.5.

All transformers have numerical voltage regulating relays (VRR) using Reyrolle Microtapp.

The 22kV bus protection consists of high impedance bus protection using ABB RADHA relays and bus distance protection using GE – D30 relays. The former will be replaced with numerical type ABB REF630 relays in the protection upgrade project.

Numerical type relays ABB REF630 and GE F35 are used for 22kV master earth fault (MEF) and backup earth fault (BUEF) protection respectively.

All 22kV feeders have numerical feeder protection using GE F650 relays.

The 22kV capacitor bank protection has overcurrent, earth fault and voltage balance schemes using a GE F650 relay.

The station has duplicated 240V AC systems and battery chargers that supply a 120V DC system for the protection relays and trip coils.

4 Identified Need

WGL commenced operation as a 66/22kV transformation station in 1962. Three 10/12.5MVA transformers were installed in 1962. A fourth 10/13.5MVA transformer was added in 1997 as a replacement for an existing 5/6.5MVA transformer, however this transformer was manufactured in 1965. A fifth 20/33MVA transformer was added in 2011. The 66kV switchyard is practically as it was constructed in the 1960s, with the exception of an additional 66kV CB added in 2011 when the fifth transformer was installed. The 22kV switchyard was replaced by an indoor switchboard in 1997.

The physical and electrical condition of these assets has deteriorated, and they are now presenting an increasing failure risk.

The station has a 66kV ring bus arrangement, but is partially switched with the four 1960's vintage transformers switched as a single group, and a normally open isolator in place of a 66kV circuit breaker between the two 66kV line entries from YPS.

The key service constraints at WGL are:

- Security of supply risk presented by the switching of four of the transformers in a single group;
- Security of supply risks presented by increased likelihood of asset failure due to the deteriorating condition of the assets;
- Health and safety risks presented by a possible explosive failure of bushings on a number of the assets;
- Plant collateral damage risks presented by a possible explosive failure of bushings on a number of the assets;
- Environmental risks associated with insulating oil spill or fire;
- Reactive asset replacement risks presented by the increasing likelihood of asset failure due to the deteriorating condition of the assets; and
- Health and safety risks presented by asbestos containing cement sheets or electrical switch boards in the main building and switchyard.

5 Assumptions underpinning the identified need

The purpose of this chapter is to summarise the key input assumptions that underpin the identified need described in the previous chapter.

5.1 Regulatory Obligations

In addressing the identified need, we must satisfy our regulatory obligations, which we summarise below.

Clause 6.5.7 of the National Electricity Rules requires AusNet Services to only propose capital expenditure required in order to achieve each of the following:

(1) meet or manage the expected demand for standard control services over that period;

(2) comply with all applicable regulatory obligations or requirements associated with the provision of standard control services;

(3) to the extent that there is no applicable regulatory obligation or requirement in relation to:

(i) quality, reliability or security of supply of standard control services; or

(ii) the reliability or security of the distribution system through the supply of standard control services

to the relevant extent:

(iii) maintain the quality, reliability and security of supply of standard control services, and

(iv) maintain the reliability and security of the distribution system through the supply of standard control services; and

(4) maintain the safety of the distribution system through the supply of standard control services.

Section 98(a) of the Electricity Safety Act requires AusNet Services to:

design, construct, operate, maintain and decommission its supply network to minimise as far as practicable –

(a) the hazards and risks to the safety of any person arising from the supply network; and

(b) the hazards and risks of damage to the property of any person arising from the supply network; and

(c) the bushfire danger arising from the supply network.

The Electricity Safety act defines ‘practicable’ to mean having regard to –

(a) severity of the hazard or risk in question; and

(b) state of knowledge about the hazard or risk and any ways of removing or mitigating the hazard or risk; and

(c) availability and suitability of ways to remove or mitigate the hazard or risk; and

(d) cost of removing or mitigating the hazard or risk.

Clause 3.1 of the Electricity Distribution Code requires AusNet Services to:

(b) develop and implement plans for the acquisition, creation, maintenance, operation, refurbishment, repair and disposal of its distribution system assets and plans for the establishment and augmentation of transmission connections:

> *(i) to comply with the laws and other performance obligations which apply to the provision of distribution services including those contained in this Code;*
>
> *(ii) to minimise the risks associated with the failure or reduced performance of assets; and*
>
> *(iii) in a way which minimises costs to customers taking into account distribution losses.*

Under clause 5.2 of the Electricity Distribution Code, AusNet Services:

> *must use best endeavours to meet targets required by the Price Determination and targets published under clause 5.1 and otherwise meet reasonable customer expectations of reliability of supply.*

5.2 Asset Condition

AMS 10-13 Condition Monitoring describes AusNet Services' strategy and approach to monitoring the condition of assets.

Asset condition is measured with reference to an asset health index on a scale of C1 to C5. Table 2 provides a description of the asset condition scores.

Table 2: Asset condition Score and Remaining Service Potential

Condition Score	Condition	Condition Description
C1	Very Good	Initial service condition
C2	Good	Deterioration has minimal impact on asset performance. Minimal short term asset failure risk.
C3	Average	Functionally sound showing some wear with minor failures, but asset still functions safely at adequate level of service.
C4	Poor	Advanced deterioration – plant and components function but require a high level of maintenance to remain operational.
C5	Very Poor	Extreme deterioration approaching end of life with failure imminent.

The condition of the key assets at WGL is discussed in the Asset Health Reports for the key asset classes such as power transformers, instrument transformers and switchgear with information on asset condition rankings, recommended risk mitigation options and replacement timeframes. A summary of the asset condition at WGL is provided in Table 3 and discussed in the following sections.

Table 3: WGL Asset Condition Summary

Asset Type	Number of assets by Condition Score				
	C1	C2	C3	C4	C5
66kV Circuit Breakers	1				2
66kV Current Transformers			6		
66kV Voltage Transformers					8
66/22kV Power Transformers	1			4	
22kV Circuit Breakers	3	15			
22kV Current Transformers	2	16	6	4	
22kV Voltage Transformers	1	5			

These condition scores are then used to calculate the asset failure rates using the Weibull parameters determined for each asset class.

5.3 Zone Substation Supply Capacity

WGL is a summer peaking station and the peak electrical demand reached 64.9MVA in the summer of 2019/20. The recorded peak demand in winter 2020 was 51.4MVA. The demand at WGL is forecast to increase at a growth rate of approximately 2.3% per annum.

Figure 3 shows the forecast maximum demand and supply capacities (cyclic ratings) for WGL.

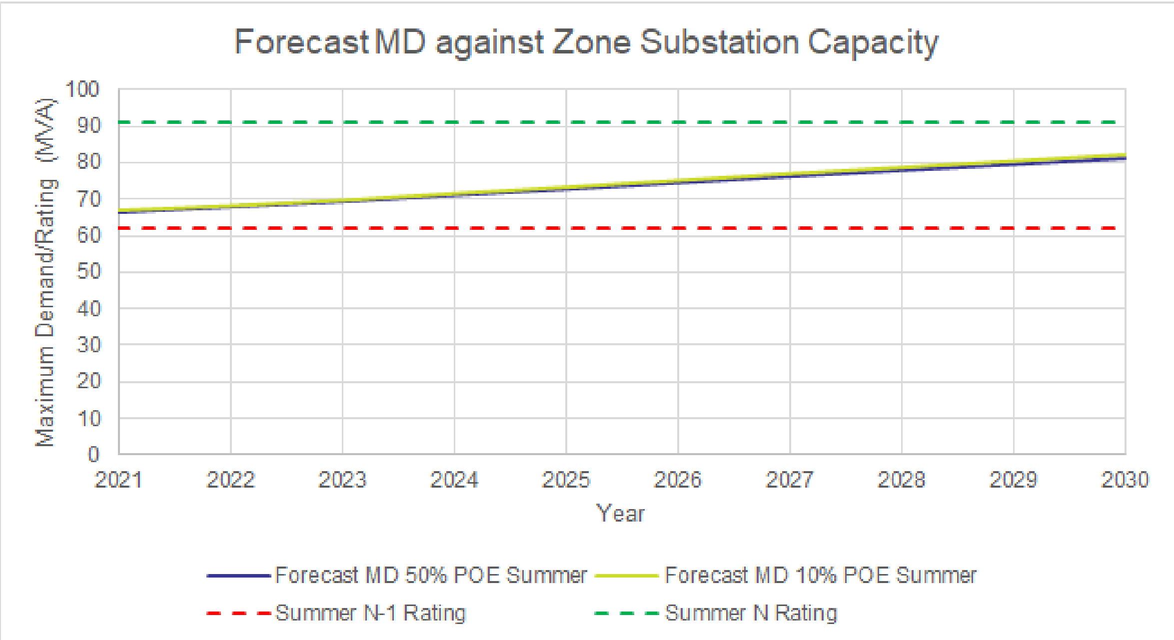

Figure 3: WGL Forecast Maximum Demand against Zone Substation Capacity

5.4 Load Duration Curves

The zone substation load duration curves that feed into the risk-cost assessment model are derived from historical actual demands between:

- 1 October 2019 and 31 March 2020 for the summer 50% probability of exceedance (POE) curves;
- 1 April 2020 and 30 September 2020 for the winter 50% POE curves;
- 1 October 2019 and 31 March 2020 for the summer 10% POE curves; and
- 1 April 2020 and 30 September 2020 for the winter 10% POE curves.

The historical hourly demands are separated by season and unitised based on the recorded maximum demand within that season (summer and winter) and time period, which allows the load duration curve to be scaled according to the seasonal forecast maximum demand for each year of the assessment period.

The 50% POE unitised load duration for WGL zone substation is presented in Figure 4, and the 10% POE unitised load duration for WGL zone substation is presented in Figure 5.

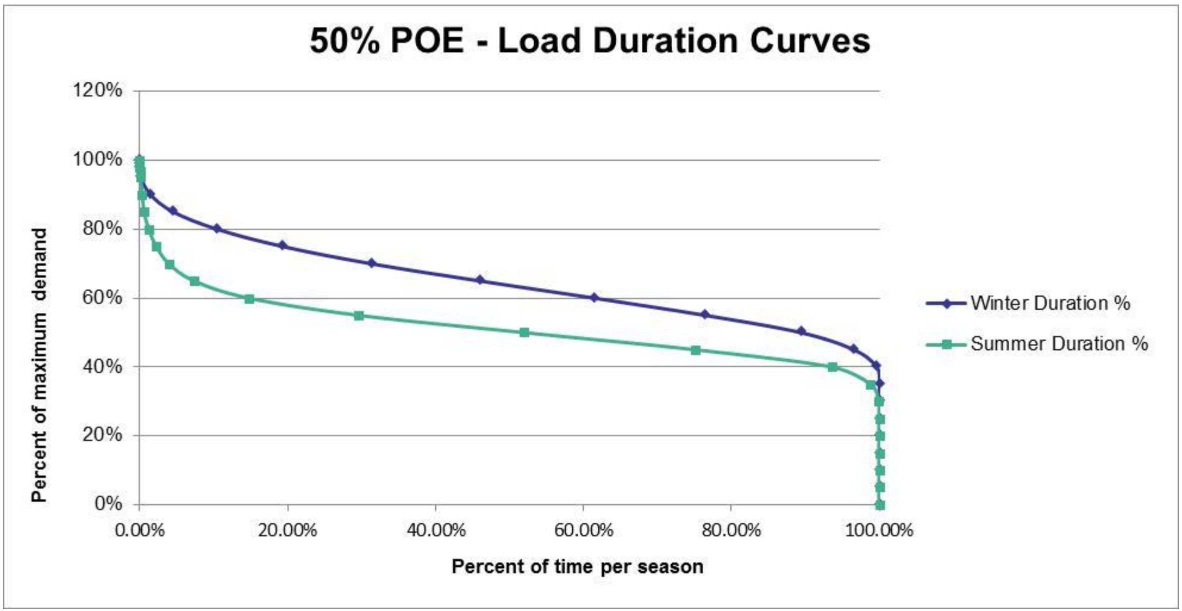

Figure 4: WGL 50% Load Duration Curves

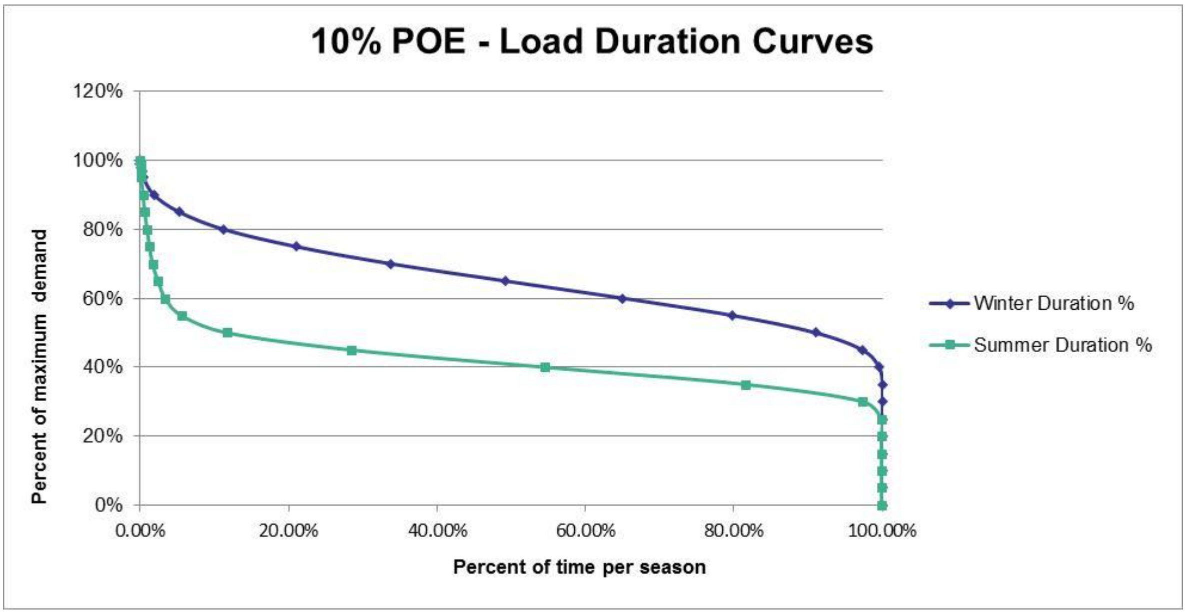

Figure 5: WGL 10% POE Load Duration Curves

5.5 Feeder Circuit Supply Capacity

A new feeder is planned for the WGL area within the next two years due to rapid load growth in the Drouin, Longwarry and Bunyip areas.

5.6 Load Transfer Capability

The Distribution Annual Planning Report (DAPR) provides the load transfer capability (in MW) of the feeder interconnections between WGL and its neighbouring zone substations. Our forecast load transfer capability for WGL is presented in Table 4.

Table 4: WGL Load Transfer Capability

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Load Transfer Capability (MW)	3.2	3.1	3.1	3.0	2.9	2.9	2.8	2.7	2.7	2.6

5.7 Station Configuration Supply Risk

Failure of some 66kV and 22kV equipment will result in supply outages to customers as backup circuit breakers operate to isolate the failed equipment.

This would be for an estimated duration of two hours, which is the typical time it takes operators to travel to site and manually re-configure circuits to isolate the failed equipment and sequentially restore supply to as many customers as possible.

Table 5 lists the estimated bus outage consequence factors for each major type of equipment based on the substation layout.

Table 5: WGL Bus Outage Consequence Factors

Equipment	Estimated Bus Outage Consequence
Transformer	0%
22kV circuit breaker	47%
66kV circuit breaker	33%
22kV current transformer	47%
66kV current transformer	33%
22kV voltage transformer	17%
66kV voltage transformer	0%

6 Credible Options

This section outlines the potential options that have been considered to address the identified invest, and summarises the key works and costs associated with implementing these options.

It presents both the credible and non-credible options considered, and, where relevant, outlines why particular option(s) are considered non-credible.

The following options have been identified to address the risk at WGL:

1. Do nothing (counterfactual)
2. Retire one transformer
3. Retire one transformer and reduce residual risk through network support
4. Use network support to defer retirement and replacement
5. Replace four transformers with two transformers and replace capacitor bank
6. Replace four transformers with two transformers, replace the existing capacitor bank and install two new 66kV circuit breakers
7. Replace four transformers with four transformers and replace capacitor bank

Each of the network options to address the identified need would need to be delivered during the 2021-25 EDPR period.

The purpose of this non-network options report is to provide an opportunity for non-network proponents to propose solutions. The options described in this section, therefore, should not be regarded as limiting the scope of potential non-network options.

6.1 Option 1: Do Nothing

The Do Nothing (counterfactual) option would not undertake any investment, outside of the normal operational and maintenance processes. Under this option, increasing supply risk would be managed by increased levels of involuntary load reduction. Increased non-supply risks, such as those associated with safety, collateral damage, reactive replacement and environmental impacts, would be accepted as unmanaged rising risk costs.

The Do Nothing (counterfactual) option establishes the base level of risk, and provides a basis for comparing potential options.

6.2 Option 2: Retire one transformer

This option tests whether the current installed capacity of the substation is still required to meet customer demand and whether equipment could be retired rather than replaced.

The estimated capital cost for this option is $100k, for associated decommission works.

6.3 Option 3: Retire one transformer and reduce residual risk through network support

This option supplements Option 2 by examining whether the addition of network support would provide a cost effective means of eliminating residual risk and therefore produce a higher net market benefit. The cost of obtaining network support will be the principal direct cost associated with this option, with capital expenditure of approximately $130k for the associated decommissioning works and setting up a network support agreement.

The purpose of this non-network options report is to test with non-network proponents whether this option is feasible and to better understand the likely costs of procuring network support.

The details of the technical requirements for network support and the maximum available funding is discussed in the next section.

6.4 Option 4: Use network support to defer retirement and replacement

This option extends option 3 to consider whether sufficient network support could be provided to avoid entirely the proposed retirement and replacement of the network assets, i.e. a network support only solution.

As noted in relation to Option 3, this option will involve relatively modest direct costs to decommission assets and set up a network support agreement. The principal costs of this option, which is to be explored with non-network proponents, is the cost of procuring network support. Further information to assist non-network proponents is provided in the next section.

6.5 Option 5: Replace four transformers with two transformers and replace capacitor bank

In this option, the three 10/12.5MVA and one 10/13.5MVA transformers are replaced with two 20/33MVA transformers. The capacitor bank is also replaced.

This option has an estimated capital cost of $12.64 million.

6.6 Option 6: Replace four transformers with two transformer, replace the existing capacitor bank and install two new 66kV circuit breakers

In this option, the three 10/12.5MVA and one 10/13.5MVA transformers are replaced with two 20/33MVA transformers. Two new 66kV circuit breakers are installed and the capacitor bank is replaced. The existing C5 66kV circuit breakers will be replaced under a separate project in the prior EDPR period.

This option has an estimated capital cost of $13.73 million.

6.7 Option 7: Replace four transformers with four transformers and replace capacitor bank

In this option, the three 10/12.5MVA and one 10/13.5MVA transformers are replaced with four 10/15MVA transformers. The capacitor bank is also replaced.

This option has an estimated capital cost of $17.64 million.

7 Requirements for non-network option

This section outlines:

- The technical characteristics that a non-network (network support generation, energy storage and/or demand management) option would be required to deliver; and
- The information that a non-network proponent should provide to AusNet Services to explore the potential provision of a non-network service.

The amount that AusNet Services would be willing to pay for a non-network service depends on the extent to which it will mitigate the risks described in the identified need. Key factors that influence the network support amount payable to proponents include availability, capacity, dispatch duration and firmness of response provided by the non-network solution.

7.1 Load reduction and location

As detailed in section 4, the identified need comprises a number of different elements, which can be grouped together in the following broad categories:

- Security of supply risk;
- Health and safety risks;
- Plant collateral damage risks;
- Environmental risks; and
- Reactive asset replacement risks.

In broad terms, these risks are asset-related and will only be mitigated by a non-network option if it is able to reduce the existing dependency on the relevant assets. For asbestos related risks associated with WGL, for example, it is highly unlikely that these risks can be mitigated by a non-network option (as the risk relates to the fabric of the building).

However, if the need for one or more transformers or other assets can be eliminated through a non-network option, then savings may result by reducing the risks associated with asset failure. The ability for a non-network solution to support an N-1 contingency on a summer peak demand day is one such scenario.

The table below sets out the load reductions that a non-network option would be required to deliver on a maximum demand day, in order to mitigate the identified risks at WGL to some extent, e.g. loss of one transformer.

Table 6: Load at risk and non-network support requirements

Year	Load at Risk (MVA)	Hours at Risk, POE50	Expected non-network support required during MD event	
			MW @ PF = 1	MWh
2021/22	6	3	6	8
2022/23	7	7	7	12
2023/24	9	13	9	16
2024/25	11	18	11	21
2025/26	13	23	13	26
2026/27	14	30	14	33
2027/28	16	41	16	41
2028/29	18	51	18	49
2029/30	19	66	19	58

If non-network options are able to reduce the load by more than this minimum amount under an N-1 scenario, then the level of risk mitigation is likely to be higher.

7.2 Power system security, reliability and fault levels

A non-network option must be capable of reliably meeting electricity demand under a range of conditions and scenarios. The non-network solution will contribute to system security and reliability to the extent that it addresses the risks arising from the identified need. The non-network option is not required to address any existing issues in relation to fault levels.

If the non-network option is a rotating or inverter-based generator operating in parallel with AusNet Services' network, the generator must comply with the requirements set out in document SOP 33-05 and other connection requirements which are set out in AusNet Services' embedded generator connections page.

7.3 Timing and operating profile

A non-network option would need to be agreed by 30 November 2021 in order to defer the adoption of a network solution. AusNet Services' expectation is that a non-network solution would be required for a minimum of five (5) years, although the duration of the service would be subject to negotiation.

A non-network option must, as a minimum, be capable of reducing network loading or increasing network capacity in the WGL supply area during the months of December to March (summer period).

For each day during this period, the network load reduction or increase in network capacity would be required over the evening period, typically 5 pm to 8 pm (AEST), ref. Figure 6.

The maximum duration of non-network support required over a day can be up to four consecutive hours per day. The non-network solution will need to be capable of operating continuously during these periods on consecutive days, to cater to peak demands until the faulted asset is repaired or replaced, and full N-rated capacity is restored at the zone substation.

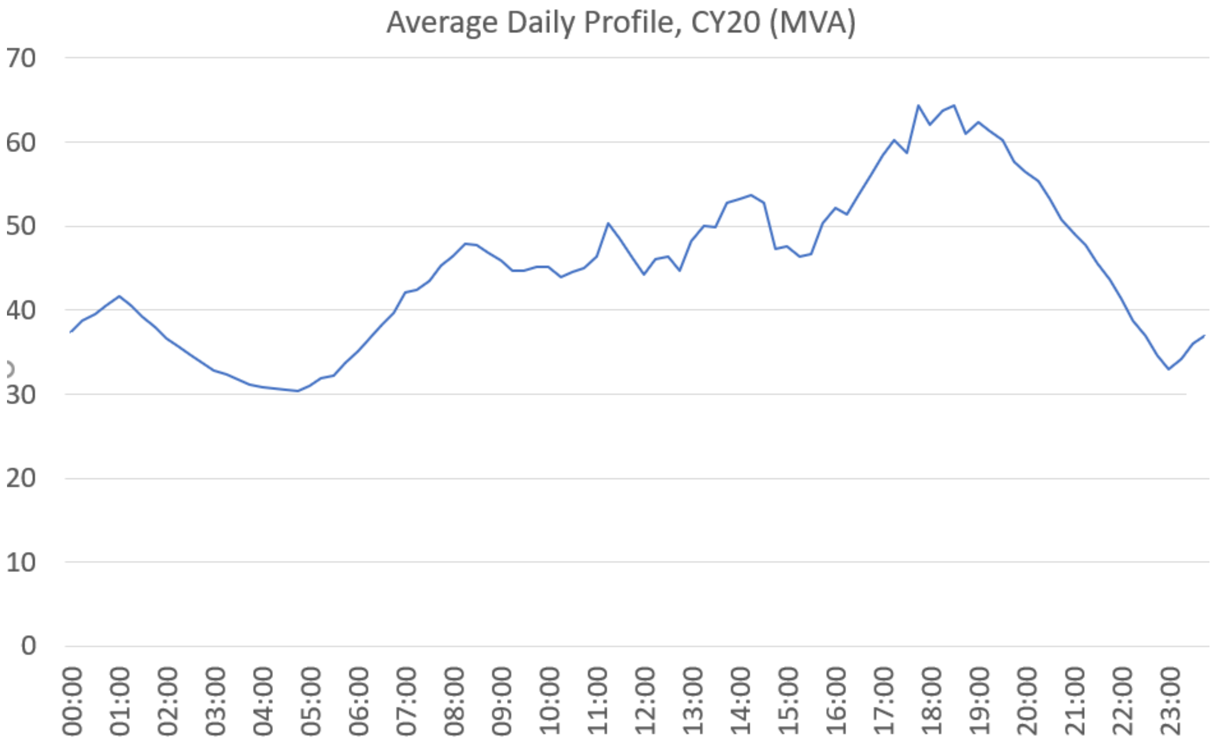

Figure 6: Average 24-hour Demand Profile, Showing Timing of Peak Demand

7.4 Guidance on potentially feasible options

The following non-network solutions are likely to be potentially feasible options to address the identified need:

- New embedded generation;
- Existing customer generation and load curtailment (firm demand management); and
- Embedded energy storage systems.

Without limiting the potential for non-network solutions, the following types of non-network options are unlikely to be feasible:

- Renewable generation not coupled with storage or dispatchable generation; and
- Unproven, experimental or undemonstrated technologies.

7.5 Data requirements from non-network service providers

Non-network service providers interested in alleviating the network constraints outlined above are advised to begin engagement with AusNet Services as soon as possible. A detailed proposal including the information listed below should be submitted by the requested date. Details required include:

- Name, address and contact details of the person making the submission.

- Name, address and contact details of the person responsible for non-network support (if different to above).
- A detailed description of the services to be provided, including:
    - Size and capacity (MW/MVA/MWh).
    - Location(s).
    - Frequency and duration.
    - Type of action or technology proposed, including response / ramp rate information, where applicable.
    - Proposed dispatching arrangement (e.g. telephone, web-based trigger, automated means via RTU).
    - Availability and reliability performance details.
    - Period of notice required to enable dispatch of non-network support (e.g. to allow time for charging of energy storage solutions or market-based limitations).
    - Proposed contract period and staging (if applicable).
    - Proposed timing for delivery (including timeline to plan and implement the proposal).
- High-level electrical layout of the proposed site (if applicable).
- Evidence and track record proving capability and previous experience in implementing and completing projects of the same type as the proposal.
- Preliminary assessment of the proposal's impact on the network.
- Breakdown of the lifecycle costs for providing the service, including:
    - Capital costs (if applicable).
    - Annual operating (i.e. set up and dispatch fees) and maintenance costs.
    - Other costs (e.g. availability, project establishment, etc.).
    - Tariff assumptions.
- A method outlining measurement and quantification of the agreed service, including integration of the proposed solution with the network.
- A statement outlining that the non-network service provider is prepared to enter into a Network Support Agreement (NSA) (subject to agreeing terms and conditions).
- Letters of support from partner organisations.
- Any special conditions to be included in an NSA.

All proposals must satisfy the requirements of any applicable laws, rules, and the requirements of any relevant regulatory authority, including following the normal network connection processes where applicable. Any network reinforcement costs required to accommodate the non-network solution will typically be borne by the proponent of the non-network solution.

For further details on AusNet Services' process for engaging and consulting with non-network service providers, and for investigating, developing, assessing and reporting on non-network options as alternatives to network augmentation, please refer to the Non-Network Solutions and Demand Management webpages, which contain the Demand Side Engagement Strategy and other relevant demand management documentation:

https://www.ausnetservices.com.au/Electricity

7.6 Potential payments to non-network proponents

As already noted, the maximum amount that AusNet Services would be willing to pay for a non-network solution would depend on the value that it provides in terms of risk reduction. The actual payment to a non-network proponent will be subject to negotiation.

Provisional analysis indicates that Option 6 is the preferred network option. If this option could be deferred *entirely* by engaging a non-network solution, the total capital expenditure of approximately $13.73 million could be deferred. The approximate maximum annual payment that would be available to a non-network proponent to defer this expenditure would be in the region of $950 k per annum. This calculation assumes a 45 year asset life, an operating expenditure allowance of 1% of the avoided network capital expenditure, and a cost of capital of 5.9% (real).

It should be emphasised, however, that in a given year the actual payment for a non-network solution may be lower than this maximum available amount, due to the aforementioned factors of availability, capacity, dispatch duration and firmness of response provided by the non-network solution.

8 Next Steps

The assessment outlined in this report shows that the service level risk to customers supplied from WGL is forecast to grow to unacceptable levels within the 2021-25 EDPR period.

The forecast increase in service level risk is driven by increasing supply and non-supply (safety, environmental, collateral damage and reactive replacement) risk due to deterioration in the condition of the assets resulting in an increasing likelihood of asset failure. AusNet Services considers that one of the credible options outlined in this report, or an alternative non-network option will be required to address the identified need.

8.1 Request for submissions

AusNet Services invites written submissions, on the matters set out in this non-network options report, from Registered Participants, AEMO, interested parties, non-network providers and those registered on our demand-side engagement register.

All submissions and enquiries should be directed to:

Fuji Dinh
Senior Engineer – Strategic Network Planning
AusNet Services
Email: ritdconsultations@ausnetservices.com.au

Submissions are due on or before 31st May 2021.

Submissions will be published on AusNet Services' website. If you do not wish to have your submission published, please clearly stipulate this at the time of lodging your submission.

8.2 Next stage of RIT-T process

Following conclusion of the non-network options report consultation period, AusNet Services will, having regard to any submissions received on this non-network options report, prepare and publish a draft project assessment report (DPAR) including:

- A summary of, and commentary on, any submissions on the non-network options report.
- A detailed market benefit assessment of the proposed credible options to address the identified need.
- Identification of the proposed preferred option to meet the identified need.

AusNet Services expects to publish the DPAR by Q2 2021.