Planning Report Bayswater (BWR) Zone Substation

AMS – Electricity Distribution Network

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Contact

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Please contact the indicated owner of the document with any inquiries.

T Langstaff
AusNet Services
Level 31, 2 Southbank Boulevard
Melbourne Victoria 3006
Ph: (03) 9695 6000

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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).

This report presents our forward looking investment plans to manage the existing and emerging service level constraints in the Bayswater (BWR) Zone Substation supply area to ensure that we maintain service levels to our customers over the short and long term. The report outlines how we quantify service risk, identifies and assesses the costs and benefits of potential options to mitigate the identified risks, and provides forward looking plans outlining the optimal service risk mitigation solutions, and timing of those solutions, to maintain service levels.

1.1 Identified Need

Bayswater Zone Substation (BWR) commenced operation as a 66/22kV transformation station in the late 1960s with three power transformers and two 66kV lines, one from Ringwood Terminal Station (RWTS) and the other from Boronia (BRA) Zone Substation.A third 66kV line was constructed in 2015 and is a three legged line from RWTS to Bayswater and Croydon.

The station has an outdoor 22kV switchyard with twn 22kV feeders. There are seventeen 22kV bulk-oil circuit breakers at the station installed in the 1960s and 1970s.

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

The station configuration includes three 66kV buses and two 22kV buses.

The emerging service constraints at BWR are:

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

1.2 Proposed Preferred Option

The options analysis identifies that the preferred option, being the one that maximises the net economic benefit to all those that produce, consume and transport electricity in the NEM, is to:

- Replace the 22kV switchgear by 2020, at an estimated capital cost of [C.I.C] (Real $2018).

Applying a discount rate of 6.44% per annum, this proposed preferred option has a net economic benefit of [C.I.C], relative to the Do Nothing Different option, over the forty-five-year assessment period.

While the optimal timing of the propsed preferred option is by 2020, to allow sufficient time to complete the regulatory investment test for distribution (RIT-D), and to smooth the overall network capital expenditure, AusNet Services plans to implement the proposed preferred option by 2022.

1.3 Next Steps

This planning report outlines the service level risk mitigation investment that AusNet Services has assessed as prudent, efficient and providing the optimal balance of supply reliability and cost.

While this report outlines AusNet Services' plans for maintaining service levels, and serves to support AusNet Services' revenue request for the 2022-26 EDPR period, the proposed investment is subject to the regulatory investment test for distribution (RIT-D).

As such, the proposed investment will be confirmed via the formal RIT-D process, which includes publication of three reports at the various RIT-D stages, and includes a formal consultation process where interested parties can make submissions that help identify the optimal solution.

2 Introduction

2.1 Purpose

This planning report outlines asset condition, asset failure risks and network development plans relevant to Bayswater (BWR) Zone Substation for the period 2022-26.

It provides an analysis of viable options to address the identified risks and maintain the efficient delivery of electrical energy from BWR consistent with the National Electricity Rules (NER) and stakeholder's requirements.

It also summarizes the scope, delivery schedule and expenditures associated with the most economical solution to emerging constraints.

2.2 Scope

The scope of this planning report is limited to the equipment within Bayswater (BWR) Zone Substation.

It excludes sub-transmission and distribution feeders entering and exiting the zone substation.

2.3 Asset Management Objectives

As stated in *AMS 01-01 Asset Management System Overview*, the high-level asset management objectives are:

- Comply with legal and contractual obligations;
- Maintain safety;
- Be future ready;
- Maintain network performance at the lowest sustainable cost; and
- Meet customer needs.

As stated in *AMS 20-01 Electricity Distribution Network Asset Management Strategy*, the electricity distribution network objectives are:

- Improve efficiency of network investments
- Maintain long-term network reliability
- Implement REFCLs within prescribed timeframes
- Reduce risks in highest bushfire risk areas
- Achieve top quartile operational efficiency
- Prepare for changing network usage.

3 Background

3.1 Substation Description

Bayswater (BWR) is located in the eastern suburbs of metropolitan Melbourne approximately 29km east of Melbourne and is the main source of supply for the suburbs of Bayswater, Croydon South, Kilsyth South, Wantirna and Heathmont.

BWR supplies approximately 16,800 AusNet Services' customers. The load at BWR includes mostly residential and commercial urban load with some industrial loads.

The Bayswater zone substation area is in the Eastern suburbs of Melbourne at an elevation of 142m above sea level.

BWR has typical Melbourne climate with summer average maximum temperatures of 26°C, winter average minimum temperatures of 6°C with extreme temperatures reaching 46°C in summer and -3°C in winter.

The average rainfall is 658mm in this area.

BWR is supplied at 66kV via three 66kV circuits that originate from Ringwood Terminal Station (RWTS), Boronia Zone Substation (BRA) and three legged line from RWTS to Bayswater & Croydon.

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

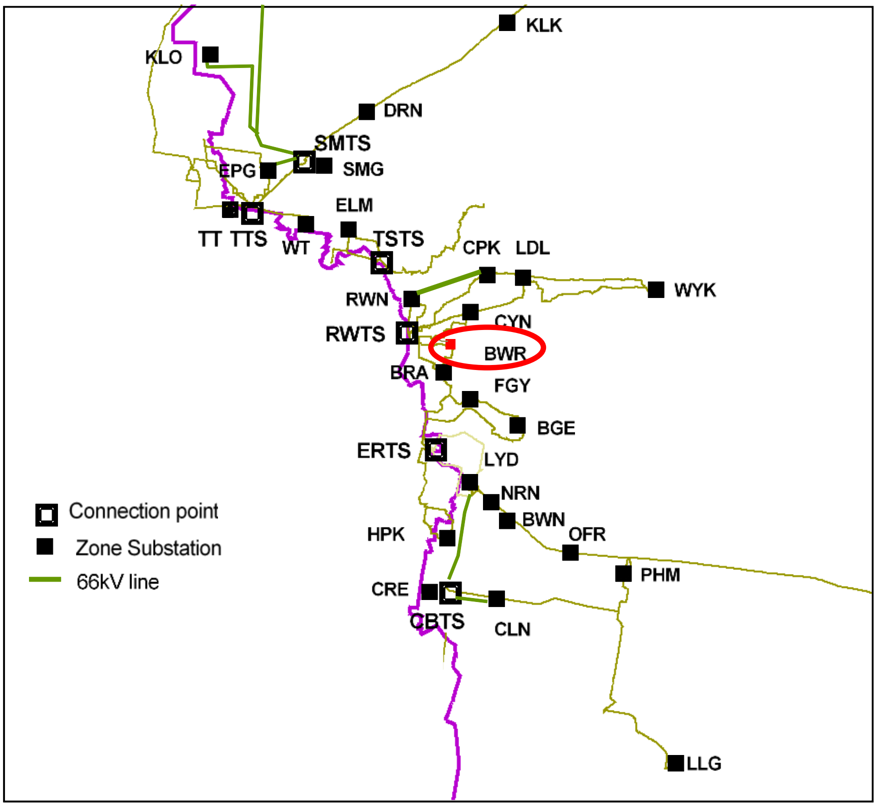

Figure 1: BWR location within AusNet Services distribution network

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

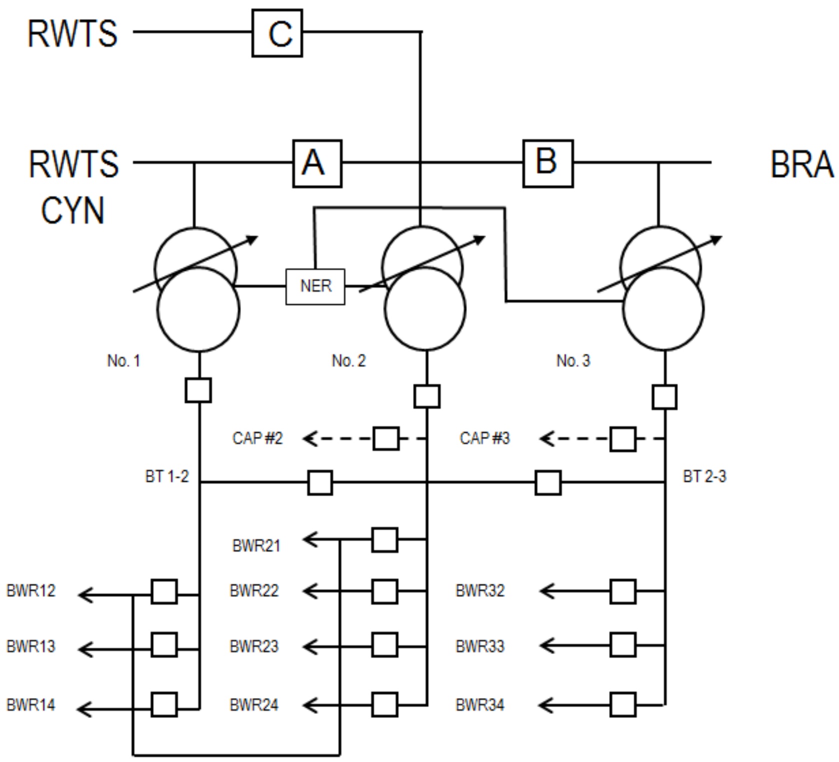

Figure 2: BWR Single Line Diagram

3.2 Customer Composition

BWR has ten 22kV feeders of which supply into the AusNet Services supply area.

Table 1 provides details of the 22kV supply feeders.

Table 1: BWR feeder information

Feeder	Feeder Length (km)	Feeder description	Number of Customers	Customer Type
BWR12	6.5	Summer peaking, urban feeder	789	25% residential 36% commercial 39% industrial 0% farming
BWR13	40.0	Summer peaking, short rural feeder	4,480	92% residential 5% commercial 3% industrial 0% farming
BWR14	1.2	Summer peaking, urban feeder	1	100% commercial
BWR21	1.2	Summer peaking, urban feeder	1	100% commercial
BWR22	10.3	Summer peaking, urban feeder	1,069	45% residential 24% commercial 31% industrial 0% farming

BWR23	19.7	Summer peaking, urban feeder	3,680	92% residential 5% commercial 3% industrial 8% farming
BWR24	8.8	Summer peaking, urban feeder	780	51% residential 33% commercial 16% industrial 0% farming
BWR32	2.9	Summer peaking, urban feeder	2,920	89% residential 8% commercial 3% industrial 0% farming
BWR33	1.2	Summer peaking urban feeder	96	3% residential 54% commercial 43% industrial 0% farming
BWR34	1.7	Summer peaking urban feeder	3,170	86% residential 13% commercial 1% industrial 0% farming

The 22kV feeders interconnect with 22kV feeders from Boronia Zone Substation, Ringwood Terminal Station and Croydon Zone Substation, providing a load transfer capability of 24.6MVA.

3.3 Zone Substation Equipment

3.3.1 Primary Equipment

BWR includes an air-insulated 66kV switchyard with three 66kV buses separated by bus-tie circuit breakers connected to three incoming 66kV lines from RWTS and BRA.

There are three 22kV air insulated busbars connected to one another with a bus tie circuit breaker and connected to the three 66/22kV transformers via three transformer circuit breakers. Ten 22kV feeders and one 6MVAr and one 12MVAr capacitor banks are connected to these 22kV busbars.

The 22kV switchyard currently has sixteen 22kV bulk oil circuit which have been assessed as being in C4 and C5 condition. The BWR32 22kV feeders circuit breaker is rated at C3.

Transformation comprises three 20/27MVA 66/22kV transformers located in the No.1, No.2 and No.3 positions two manufactured by [C.I.C] rated at C4 and the other manufactured by

[C.I.C] rated at C3 and installed at BWR zone substation in the late 1960s.

3.3.2 Secondary Equipment

The three incoming 66kV lines and buses are protected by current differential and remote trip send and directional overcurrent protection using modern [C.I.C] and [C.I.C] relays.

The No.1, No.2 and No.3 66/22kV the transformer differential protection is provided by new transformer differential protection [C.I.C] relays.

The 22kV bus protection consists of low impedance bus protection and bus distance protection using [C.I.C] and [C.I.C] relays.

The 22kV feeder circuit breakers have master earth fault and back up earth fault protection using older [C.I.C], [C.I.C] and [C.I.C] relays.

The 22kV capacitor bank protection has overcurrent, earth fault and voltage balance schemes using a [C.I.C] relay.

The station has duplicated 24V AC systems and battery chargers that supply a 125V DC system for the protection relays and trip coils.

3.4 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 BWR 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 condition is provided in Table 3 and discussed in the following sections.

Table 3: BWR Asset Condition Summary

Asset Type	Number of Assets				
	C1	C2	C3	C4	C5
66kV Circuit Breakers	3				
66kV Current Transformers					3
66kV Voltage Transformers	3				2
66/22kV Power Transformers			1	2	
22kV Circuit Breakers			2	9	7
22kV Current Transformers	1				1
22kV Voltage Transformers		3			

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

3.5 Zone Substation Supply Capacity

BWR is a summer peaking station and the peak electrical demand reached 58.4MVA in the summer of 2017/18. The recorded peak demand in winter 2018 was 43MVA.

The demand at BWR is forecast to increase slowly at a growth rate of less than 0.5% per annum.

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

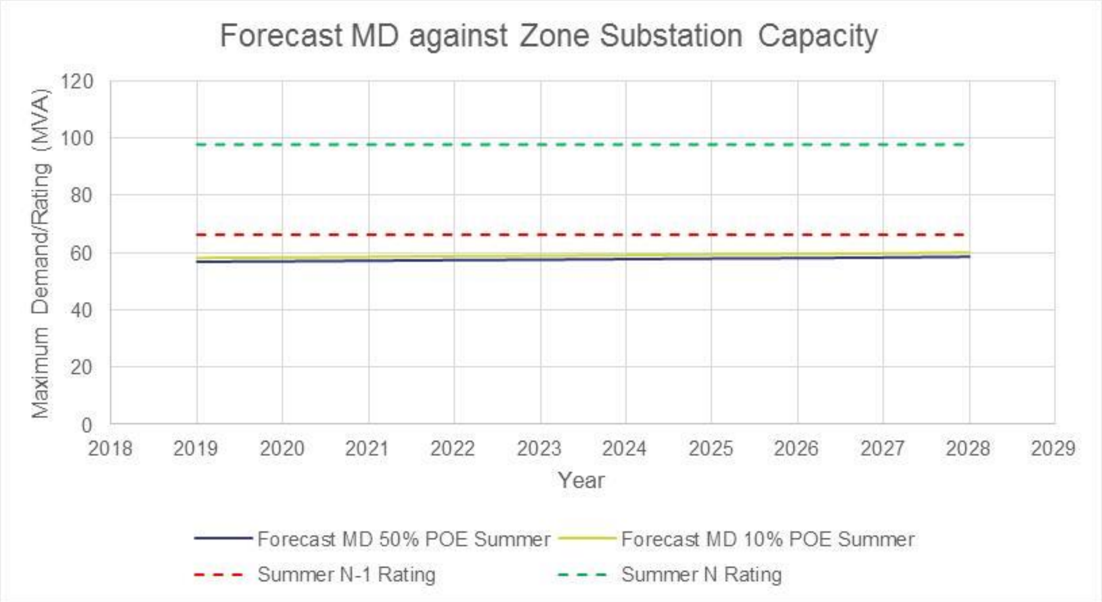

Figure 3: BWR Forecast Maximum Demand against Zone Substation Capacity

3.6 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 2016 and 31 March 2017 for the summer 50% probability of exceedance (POE) curves;
- 1 April 2017 and 30 September 2017 for the winter 50% POE curves;
- 1 October 2013 and 31 March 2014 for the summer 10% POE curves; and
- 1 April 2017 and 30 September 2017 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 BWR zone substation is presented in

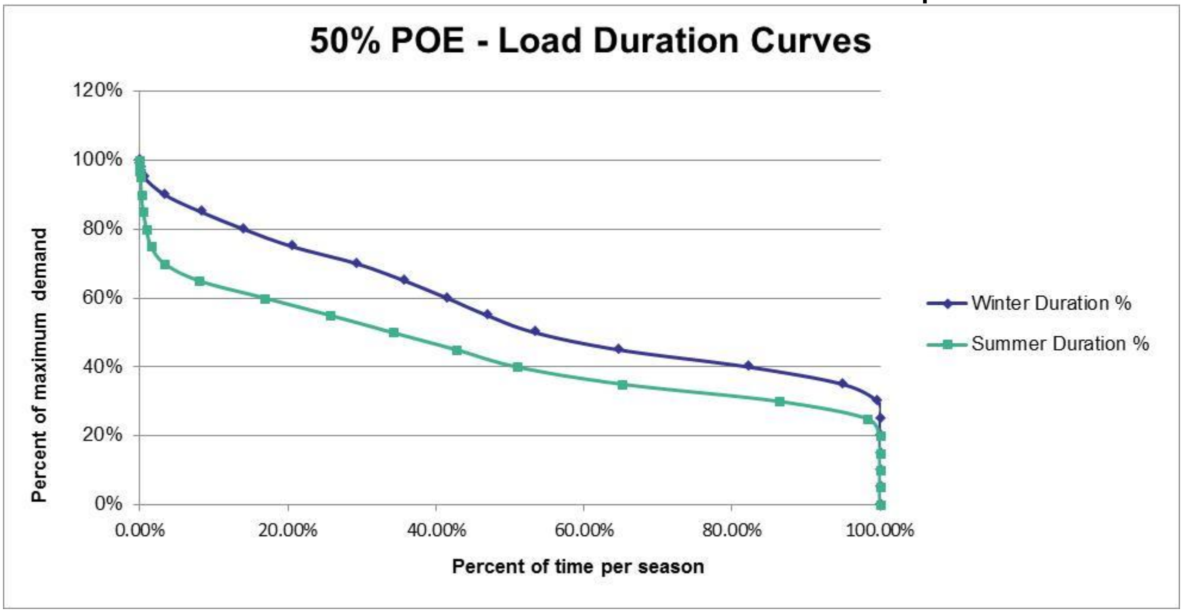

Figure 4, and the 10% POE unitised load duration for BWR zone substation is presented in Figure 5.

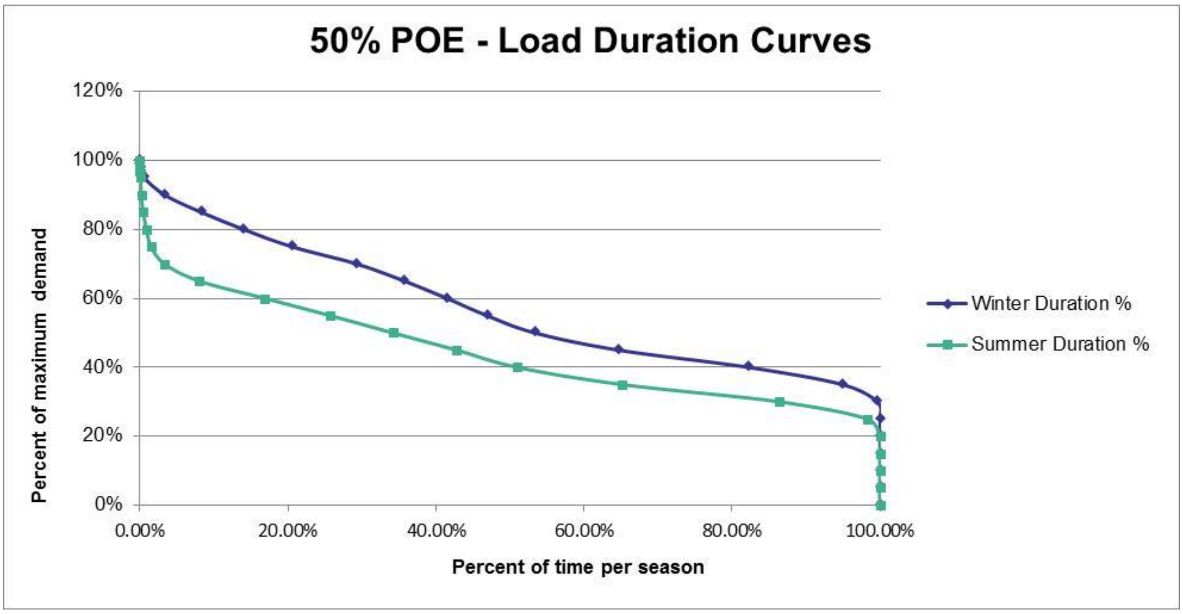

Figure 4: BWR 50% Load Duration Curves

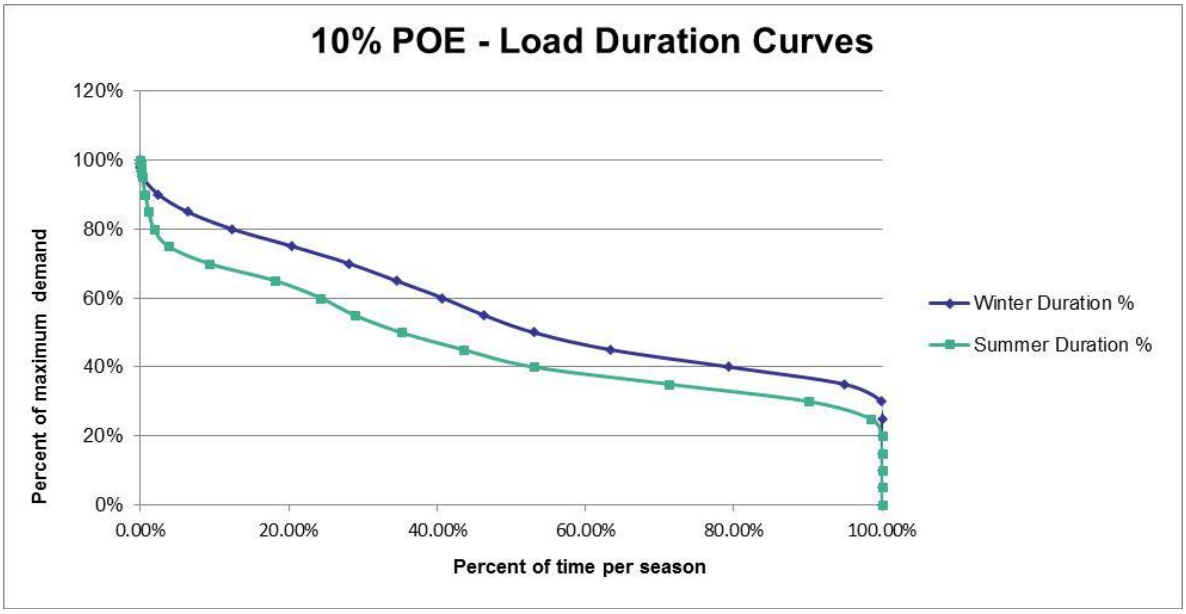

Figure 5: BWR 10% POE Load Duration Curves

3.7 Feeder Circuit Supply Capacity

There is currently no requirement for additional feeders at BWR due to the low load growth in the area.

3.8 Load Transfer Capability

The Distribution Annual Planning Report (DAPR) provides the load transfer capability (in MW) of the feeder interconnections between BWR and its neighbouring zone substations.

This is then forecast forward in line with the forecast demand growth to give the forecast load transfer capability in Table 4.

Table 4: BWR Load Transfer Capability

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Load Transfer Capability (MW)	24.6	24.5	24.4	24.3	24.3	24.2	24.1	24.0	23.9	23.9

4 Other Issues

4.1 Regulatory Obligations

This planning report acknowledges AusNet Services obligations as a Distribution Network Service Provider under the National Electricity Rules with particular emphasis on:

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.*

4.2 Station Configuration Supply Risk

Failure of some 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 a failure of each major type of equipment based on the substation layout.

Table 5: BWR Bus Outage Consequence Factors

Failed Equipment	Estimated Bus Outage Consequence
Transformer	0%
22kV circuit breaker	37%
66kV circuit breaker	0%
22kV current transformer	37%
66kV current transformer	0%
22kV voltage transformer	33%
66kV voltage transformer	0%

5 Identified Need

Bayswater Zone Substation (BWR) commenced operation as a 66/22kV transformation station in the late 1960s with three power transformers and two 66kV lines, one from Ringwood Terminal Station (RWTS) and the other from Boronia (BRA) Zone Substation.The third 66kV line was constructed in 2015 and it is a three legged line from RWTS to Bayswater and Croydon.

The station has an outdoor 22kV switchyard with twn 22kV feeders. There are seventeen 22kV bulk-oil circuit breakers at the station which were installed in the 1960s and 1970s.

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

The station configuration includes three 66kV buses and three 22kV buses.

The emerging service constraints at BWR are:

- Security of supply risks presented by the increased likelihood of failure due to the deteriorating condition of the assets;
- Security of supply risks due to the configuration of the 22kV switchyard;
- Health and safety risks presented by a possible explosive failure of the bushings on a number of the assets;
- Plant collateral damage risks presented by a possible explosive failure of a number of the assets;
- Environmental risks associated with insulating oil spill or fire; and
- Reactive asset replacement risks presented by the increasing likelihood of asset failure due to the deteriorating condition of the assets.

6 Risk and Options Analysis

6.1 Risk-Cost Model Overview

AusNet Services' risk-cost model quantifies the benefits of potential investment options by comparing the service level risk of the Do Nothing (Counterfactual) option with the reduced service level risk assuming the credible option is place.

The investment cost to implement the credible option is then subtracted from the monetised benefit to compare credible options and identify the option that maximises the net economic benefit (the proposed preferred option).

The areas of service level risk costs, and risk cost reduction benefits, that AusNet Services considers include:

- Supply risk;
- Safety risk;
- Collateral damage risk;
- Reactive replacement risk;
- Environment risk;
- Operations and maintenance costs; and
- Losses.

Further details on the model can be found in AusNet Services' Risk-Cost Assessment Model Methodology paper.

6.2 Options to Address Risks

This section outlines the potential options that have been considered to address the identified service level risk and need to 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 are considered non-credible.

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

1. Do nothing
2. Retire one transformer
3. Retire one transformer and sure up supply capacity via network support
4. Use network support to defer retirement and replacement
5. Replace all 22kV switchgear
6. Replace one transformer and 22kV switchgear
7. Replace two transformers and 22kV switchgear

An economic cost-benefit assessment is used to assess and rank the economic efficiency of each option.

The following sections provide a brief summary of each of these options.

6.2.1 Option 1: Do Nothing

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

Since this option assumes no investment outside of the normal operational and maintenance processes, this is a zero investment cost option.

6.2.2 Option 2: Retire one transformer

This options 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 capital cost for this option is [C.I.C], for associated decommissiong works.

6.2.3 Option 3: Retire one transformer and sure up supply capacity via network support

This option tests whether the current installed capacity of the substation is still required to meet customer demand and whether equipment could be retired and network support used rather than replacing poor condition assets.

The capital cost for this option is [C.I.C], for associated decommissiong works and setup of a 20MW network support agreement.

In addition to the capital cost, there is ongoing operational costs associated with this option that represent the network support availability and activation costs, and which vary year-by-year based on the network support expected under this option, as outlined in Table 6.

Table 6: Network support services annualised costs ($ million)

2021	2022	2023	2024	2025
C.I.C				

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

This options tests whether network support can be used to defer the replacement of poor condition assets. This option addresses the supply risks associated with poor condition assets, but does not address the safety, environmental or collateral damage risks as the assets remain in service.

The capital cost of this option is [C.I.C], for setup of a 20MW network support agreement.

In addition to the capital cost, there is ongoing operational costs associated with this option that represent the network support availability and activation costs, and which vary year-by-year based on the network support expected under this option, as outlined in Table 7.

Table 7: Network support services annualised costs ($ million)

2021	2022	2023	2024	2025
C.I.C				

6.2.5 Option 5: Replace 22kV switchgear

This option replaces all existing deteriorated outdoor 22kV bulk oil circuit breakers in C4 and C5 condition with three new indoor switchboards and associated secondary equipment with the new control building.

This option does not address the risks associated with the 66/22kV power transformers.

This option has a capital cost of [C.I.C].

6.2.6 Option 6: Replace one transformer and 22kV switchgear

This option replaces all 22kV circuit breakers as per Option 5 with the addition of the replacement of No.2 66/22kV power transformer.

No.1 66/22kV power transformer will be replaced seven years after the completion of stage 1, thus does not immediately address the risks associated with this power transformer.

This option has a capital cost of [C.I.C].

6.2.7 Option 7: Replace two transformers and 22kV switchgear

This option replaces all 22kV circuit breakers as per Option 5 with the addition of the replacement of both No.1 and No.2 66/22kV power transformers.

This option has a capital cost of [C.I.C].

6.3 Risk-Cost Model Results

6.3.1 Existing Service Level Risk

Figure 6 shows the existing service level risk. The risk costs are dominated by supply risk and non- supply risks (safety, environment, collateral damage and reactive replacement). The escalation in the risk costs over time is driven by deterioration in the condition of the assets.

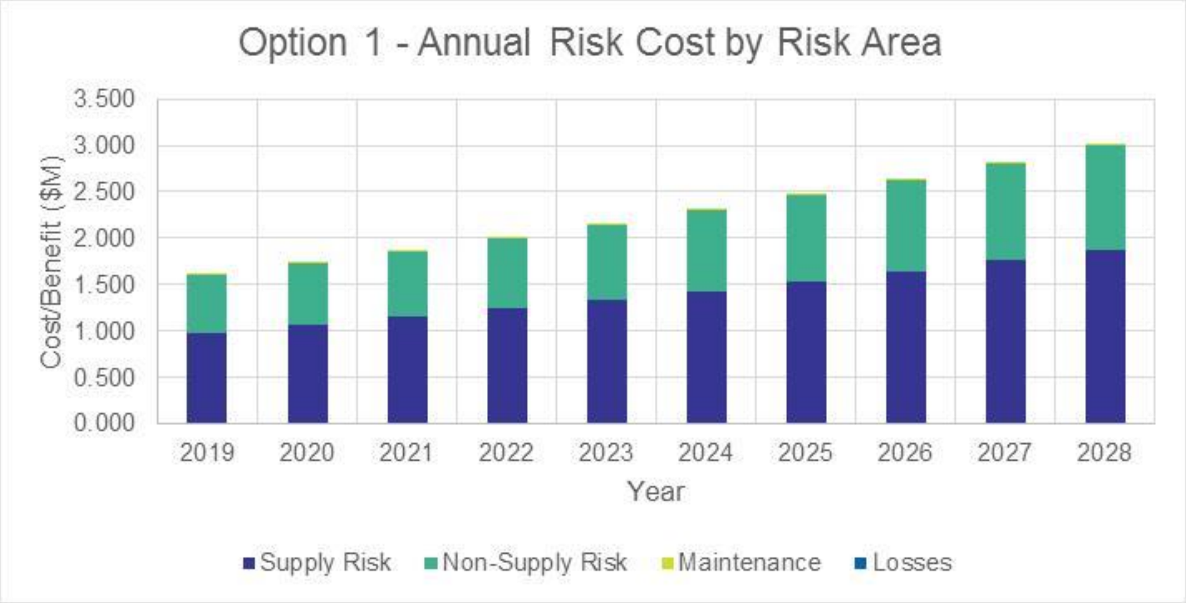

Figure 6: Do Nothing Different – Service Level Risk Cost

6.3.2 Economic Cost Benefit Analysis

The economic analysis allows comparison of the economic cost and benefits of each option to rank the options and to determine the economic timing of the preferred option.

It quantifies the capital, operation and maintenance costs along with service level risk reduction benefits for each option.

Table 8 lists the annualised net economic benefit of each option for each year, with the option that maximises this benefit highlighted.

Table 8: Annualised net economic benefit ($M)

	2020	2021	2022	2023	2024	2025	2026	2027	2028
Option 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Option 2	C.I.C
Option 3	
Option 4	
Option 5	
Option 6	
Option 7	
Option 8	

This indicates that Option 5 is the most economic option for the entire analysis period.

6.3.3 Sensitivity Analysis

Table 9 presents the net present value of net economic benefits under a variety of sensitivities. The net economic benefit assessment takes account of each option's total capital, operating and maintenance costs, compared to the reduction in service level risk cost that option is expected to deliver.

The robustness of the economic assessment is tested for the following sensitivities:

- Asset failure rates, varied at ±50% of the base failure rate;
- Maximum demand forecasts, varied to ±5% of the base forecast;
- Value of customer reliability (VCR), varied to ±25% of the base VCR;
- Proposed option costs, varied to ±15% of the base option cost;
- Value of statistical life (VoSL) [C.I.C], varied from a [C.I.C] low case, to a [C.I.C]high case; and
- Discount rate of 6.44%, varied to ±2% per annum of the base discount rate.

The preferred option under each sensitivity is highlighted, and the option that maximises net benefits under the majority of sensitivities is considered the proposed preferred option.

Table 9: NPV of Net Economic Benefit Analysis

Scenario	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
Base Case	$0.00	C.I.C						
High Asset Failure Rate	$0.00							
Low Asset Failure Rate	$0.00							
High Demand	$0.00							
Low Demand	$0.00							
High VCR	$0.00							
Low VCR	$0.00							
High Option Cost	$0.00							
Low Option Cost	$0.00							
High VoSL	$0.00							
Low VoSL	$0.00							
High Discount Rate	$0.00							
Low Discount Rate	$0.00							

The sensitivity analysis indicates the preferred option is Option 5, as it has the highest net benefit under the majority of sensitivities tested.

6.3.4 Optimal Economic Timing of Proposed Preferred Option

The annual benefit of implementing a credible alternative option to the Do Nothing Different (counterfactual) is the difference between total service level risk cost with a credible option in place, and the total service level risk cost of the Do Nothing Different option.

The optimal economic timing of the proposed option is the point in time when the annual benefit of implementing the proposed option outweighs the annualised cost to implement that option.

The optimal economic timing to implement the proposed preferred option is by 2020, as presented in Figure 7.

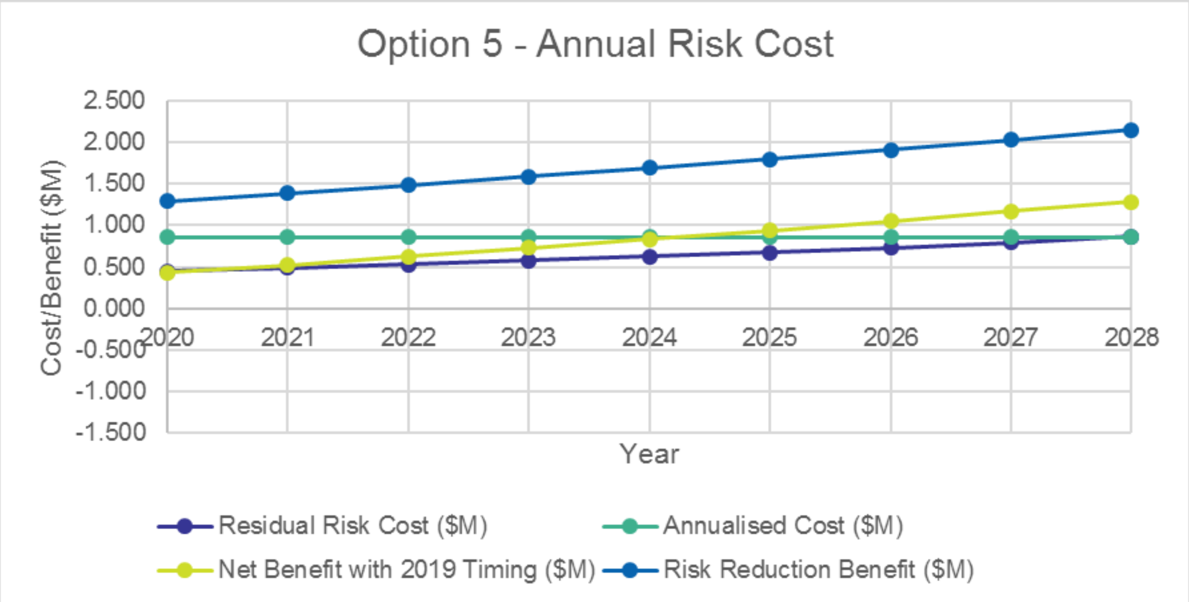

Figure 7: Economic timing of the proposed preferred option

7 Conclusion and Next Steps

The assessment outlined in this report shows that the service level risk to customers supplied from Bayswater (BWR) Zone Substation is forecast to grow to unacceptable levels within the 2022-26 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 driven by deterioration in the condition of the assets resulting in an increasing likelihood of asset failure.

7.1 Proposed Preferred Option

The options analysis identifies that the preferred option, being the one that maximises the net economic benefit to all those that produce, consume and transport electricity in the NEM, is to:

- Replace the 22kV switchgear by 2020, at an estimated capital cost of [C.I.C] (Real $2018).

Applying a discount rate of 6.44% per annum, this proposed preferred option has a net economic benefit of [C.I.C], relative to the Do Nothing Different option, over the forty-five-year assessment period.

While the optimal timing of the proposed preferred option is by 2020, to manage the deliverability, allow sufficient time to complete the required regulatory investment test for disctrubition (RIT-D), and to spread the capital expenditure throughout the 2022-26 EDPR, AusNet Services plans to implement the proposed preferred option by 2022.

7.2 Next Steps

This planning report outlines the service level risk mitigation investment that AusNet Services has assessed as prudent, efficient and providing the optimal balance of supply reliability and cost.

While this report outlines AusNet Services’ plans for maintaining service levels, and serves to support AusNet Services’ revenue request for the 2022-26 EDPR period, the proposed investment is subject to the regulatory investment test for distribution (RIT-D).

As such, the proposed investment will be confirmed via the formal RIT-D process, which includes publication of three reports at the various RIT-D stages, and includes a formal consultation process where interested parties can make submissions that help identify the optimal solution.

APPENDIX A PREFERRED OPTION DETAILS

A.1 Scope of Work

The high level scope of work of the preferred solution includes:

- Install three new indoor 22kV modular switchboards with integral feeder protection, bus protection and capacitor protection and control configured as three 22kV buses with one transformer incomer, four 22kV feeders, one capacitor bank and two bus ties;
- Reconnect all ten 22kV feeders and new capacitor bank to new indoor switchgear;
- Demolish and remove existing outdoor 22kV switchgear;
- Replace existing No.2 22kV capacitor bank with new 12MVar capacitor bank;
- Associated protection works; and
- Upgrade station fencing, switchyard lighting, surfaces, drainage, trenches to current standards.

A.2 Project Cost Summary

<table>
<tr><td>Design</td><td rowspan="24">C.I.C</td></tr>
<tr><td>SPA internal costs</td></tr>
<tr><td>Sub-contractor indirects</td></tr>
<tr><td>66kV equipment</td></tr>
<tr><td>22kV equipment</td></tr>
<tr><td>Transformers</td></tr>
<tr><td>Line works</td></tr>
<tr><td>Infrastructure - civil works</td></tr>
<tr><td>Infrastructure - building works</td></tr>
<tr><td>Infrastructure - services</td></tr>
<tr><td>Protection & control systems</td></tr>
<tr><td>Land / easement purchase</td></tr>
<tr><td>Metering cost</td></tr>
<tr><td>Outages</td></tr>
<tr><td>Spares</td></tr>
<tr><td>Nominal risk allowance</td></tr>
<tr><td>Project direct costs</td></tr>
<tr><td>Management contingency</td></tr>
<tr><td>Project direct costs plus contingency</td></tr>
<tr><td>Overheads</td></tr>
<tr><td>Finance charges</td></tr>
<tr><td>Operating expenditure</td></tr>
<tr><td>WDV (written down value) of assets to be retired</td></tr>
<tr><td>Total</td></tr>
</table>