RIT-D: Brunswick and Fitzroy Supply Area – Final Project Assessment Report

CitiPower Pty Ltd

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1. Executive summary

1.1 Summary

CitiPower is a regulated Victorian electricity distribution business. It distributes electricity to around 349,000 homes and businesses in Melbourne's central business district (CBD) and inner suburbs.

The CitiPower electricity distribution network consists of around 57,491 poles and over 8,019 kilometres of overhead lines and underground cables. Electricity is received via 70 sub-transmission lines at 33 zone substations, where it is transformed from sub-transmission voltages down to distribution voltages.

The area of CitiPower's electricity distribution network that is the subject of this Regulatory Investment Test for Distribution (RIT-D) is the Brunswick and Fitzroy supply area. The Brunswick (BK) and Fitzroy (F) zone substations that service the supply area have aged 6.6 kV equipment nearing end of life, including the switchboards and transformers which are nearing end of life. These assets will either need to be decommissioned or progressively replaced to facilitate an ongoing reliable supply for our customers and a safe operating environment for our staff. Furthermore, the BK and F zone substations border on 11 kV zone substations, creating an island with no load transfer capacity to cater for expected load growth within the supply area and network contingencies.

CitiPower has identified potential credible network options to address the safety and reliability of supply risks at BK and F and investigated whether viable non-network or stand-alone power system (SAPS) solutions exist as alternatives to, or supplements for the network options.

1.2 Purpose

This report has been prepared by CitiPower in accordance with the requirements of clause 5.17.4, paragraph (r) of the National Electricity Rules (NER) version 230.

The purpose of this report is to confirm the preferred option to address the identified need, associated with the network safety and reliability limitations within the Brunswick and Fitzroy supply area. This report has been prepared following the publication of the Notice of Determination and Draft Project Assessment reports and represents the final stage of the RIT-D process.

The preferred option converts the BK and F 6.6 kV distribution network to 11 kV, and offloads F to CW, and BK to WB at 11 kV in their entirety. This allows BK and F and their 22 kV sub-transmission networks to be decommissioned, to address the identified need articulated in the Notice of Determination and Draft Project Assessment reports. The cost of the preferred option is $57.5M (real, 2024-25) and is required to be commissioned by November 2027.

1.3 Notice of Determination Report

In January 2025, CitiPower published a Notice of Determination report in accordance with clause 5.17.4, paragraphs (c) and (d) of the NER. The purpose of that report was to present the potential credible options considered, and to explain the reasons for concluding that there would unlikely be any potential credible non-network or stand-alone power system (SAPS) options (or any combination of those options, or with a network option) that could adequately and economically address the identified need within the Brunswick and Fitzroy supply area.

1.4 Draft Project Assessment Report

In January 2025, CitiPower published a Draft Project Assessment report (DPAR) in accordance with clause 5.17.4, paragraph (j) of the NER as the total cost of the most expensive credible network option to address the identified need, is more than the trigger threshold of $14M[1] for the publication of, and consultation on, a DPAR. The purpose of that report was to quantify the safety and reliability of supply risks associated with network capacity limitations within the Brunswick and Fitzroy supply area. The DPAR analysed alternative credible options for economically mitigating those risks, and identified the proposed preferred option based on a cost-benefit analysis.

[1] https://www.aer.gov.au/industry/registers/resources/reviews/2024-cost-thresholds-review-regulatory-investment-test

1.5 Final Project Assessment Report

Following publication of the Notice of Determination report and DPAR, CitiPower is required to prepare and publish a Final Project Assessment Report (FPAR), as required under NER clause 5.17.4, paragraph (r), as the total cost of the proposed preferred option to address the identified need, is more than the trigger threshold of $28M[2] for the publication of a FPAR. This report updates any changes from and submissions to the DPAR and confirms the preferred option.

The NER requires that the FPAR includes matters detailed in NER clause 5.17.4, paragraph (j) as follows:

- provide background information on the network servicing the Brunswick and Fitzroy supply area and its limitations
- describe the need which CitiPower is seeking to address, together with the assumptions used in identifying that need
- provide a summary of, and commentary on, the submissions on the DPAR
- describe the credible options that are considered in this RIT-D assessment
- describe the methods used in quantifying each material market benefit
- explain the materiality of each class of market benefit
- quantify costs, high-level cost breakdowns, and material market benefits for each of the credible options
- present the results of a Net Present Value (NPV) analysis, with explanatory statements regarding the results and
- confirm the preferred option, its costs, optimum timing and its technical characteristics.

1.6 The identified need

The identified need for this RIT-D is triggered by ageing network asset condition, maximum electricity demand growth and lack of available load transfer capacity within the Brunswick and Fitzroy supply area, serviced by BK and F zone substations.

The identified need for the Brunswick and Fitzroy supply area is to address the:

- safety and reliability of supply risks associated with the deteriorating condition of 6.6 kV switchboards, 22/6.6 kV transformers, 11/6.6 kV auto-transformers, 22 kV sub-transmission cables and secondary systems at BK and F
- reliability of supply risks at BK and F, due to the lack of network capacity during normal operating conditions (N) and
- reliability of supply risks at BK and F, due to the lack of network capacity from limited load transfer capability between zone substations, during single contingency conditions (N-1).

Solutions to the identified need will manage and mitigate the forecast increases of expected unserved energy (EUE) and safety risk resulting from ageing asset condition, load at risk capacity limitations caused by maximum demand growth, and lack of load transfer capacity at BK and F. Solutions are needed to maintain reliability of electricity supply to CitiPower's customers, and to meet our safety obligations.

Table 1 summarises the forecast impact of the identified network need on customers. The table shows over a 10-year forecasting period, the safety (asset condition related) and reliability of supply (capacity overload related) risk costs, being the market benefits considered for this RIT-D.

Table 1: Summary of risk costs ($'000, real 2024-25)

Year	Safety (asset condition)	EUE (capacity overload)	Total risk cost
2025	171	0	**171**
2026	176	121	**296**
2027	182	1,581	**1,763**
2028	191	6,392	**6,583**
2029	202	16,622	**16,824**

[2] https://www.aer.gov.au/industry/registers/resources/reviews/2024-cost-thresholds-review-regulatory-investment-test

2030	216	34,228	**34,444**
2031	234	52,856	**53,090**
2032	255	76,699	**76,954**
2033	283	106,886	**107,169**
2034-46	322	140,306	**140,628**

The reliability of supply risk (EUE) cost is the value of the energy at risk after considering the probability and duration of forced outages of network assets at BK, F and their upstream sub-transmission circuits and load transfer capacity, representing the deterioration in supply reliability within the Brunswick and Fitzroy supply area.

The safety risk cost is the expected value of safety incidents associated with ageing network asset condition at BK and F representing the deterioration in safety. No safety disproportionality factor has been applied to the risk cost.

For the purposes of this RIT-D, economic evaluations are undertaken over a 20-year period. This risk cost profile is regarded as the base case, summarised in Table 2.

Table 2: Base case

Option	Description
Do nothing (status quo)	This base case option involves continuing to operate the existing ageing condition network assets within the supply area under the forecast maximum demands. That is, no expenditure is incurred, and any capacity shortfalls or asset condition failures are addressed through customer load shedding. The present value of all costs (safety and EUE risk) is $1,188M (real, 2024-25).

1.7 Credible options for addressing the identified need

Table 3 provides a summary of credible options that address the identified need.

Table 3: Credible options

Option	Description
1. Offload F to CW and offload BK to WB at 11 kV	This option converts the 6.6 kV distribution network to 11 kV and offloads F to CW, and BK to WB at 11 kV in their entirety. This allows BK and F and their 22 kV sub-transmission network to be decommissioned. The total capital cost of this option is $57.5M (real, 2024-25). The present value of all costs (capital, O&M, safety and EUE risk) is $87.0M (real, 2024-25).
2. Install 3rd 66/11 kV transformer at CW as part of offload of F to CW and BK to WB at 11 kV	This option undertakes Option 1 plus the installation of a 3rd 66/11 kV transformer at CW. The total capital cost of this option is $64.5M (real, 2024-25). The present value of all costs (capital, O&M, safety and EUE risk) is $95.3M (real, 2024-25).
3. Rebuild C as a 66/11 kV zone substation and offload BK and F to C at 11 kV	This option rebuilds the decommissioned C zone substation to 66/11 kV, converting the 6.6 kV distribution network to 11kV, and offloads F and BK to C at 11kV in their entirety. This allows BK and F and their 22 kV sub-transmission network to be decommissioned. The total capital cost of this option is $77.7M (real, 2024-25). The present value of all costs (capital, O&M, safety and EUE risk) is $119.2M (real, 2024-25).

4. Asset replacement at BK and F (in-situ)	This option replaces all ageing condition equipment at BK and F (in-situ), including the 6.6 kV switchboards and 22/6.6 kV transformers, retaining the existing distribution network voltage at 6.6 kV. This option allows BK and F to continue to remain in service. The total capital cost of this option is $30.9M (real, 2024-25). The present value of all costs (capital, O&M, safety and EUE risk) is $1,127M (real, 2024-25).

The purpose of the RIT-D is to identify the preferred option, being the credible option that maximises the present value of net market benefit to all those who produce, consume and transport electricity in the National Electricity Market (NEM), as well as that arising from changes in Australia's greenhouse gas emissions. To quantify the net market benefits of each credible option, the value of EUE and safety risk cost under the base case (where no action is taken by CitiPower) is compared against the value of EUE and safety risk cost with each of the credible options in place.

1.8 Scenarios and sensitivities considered

To test the robustness of the RIT-D preferred option to changes in assumptions, a set of sensitivities to key input variables of the analysis has been applied. Table 4 lists the variables and respective ranges adopted for the purpose of defining sensitivities.

Table 4: Sensitivity analysis variables

Sensitivity testing	Lower bound	Base value	Upper bound
Maximum demand	90%	100%	105%
Capital and operational costs	80%	100%	120%
Value of customer reliability	80%	100%	120%
Discount rate	2.22%	4.43%	6.65%
Asset failure rates	85%	100%	115%

The NER stipulates that the RIT-D must be based on a cost-benefit analysis that considers several reasonable scenarios of future supply and demand[3]. For the identified need in this RIT-D assessment, the major input variables that impact future reliability and safety outcomes within the Brunswick and Fitzroy supply area, are changes in the demand for electricity and changes in the asset failure rates. The scenarios and their weightings that are used in the economic evaluation to identify the preferred option, are summarised in Table 5.

Table 5: Scenario variables and weightings

Scenario definition	Low scenario	Central scenario	High scenario
Weighting	25%	50%	25%
Maximum demand	90%	100%	105%
Asset failure rate	85%	100%	115%

Four scenarios are considered:

- central scenario (maximum demand and asset failure rate set to the base values in Table 4)
- low scenario (maximum demand and asset failure rate set to the lower bound values in Table 4)
- high scenario (maximum demand and asset failure rate set to the upper bound values in Table 4)
- weighted scenario (comprising 25% worth of low scenario; 50% worth of central scenario; and 25% of high scenario).

[3] NER: clause 5.17.1(c) paragraph 1

1.9 NPV results

Table 6 sets out a comparison of the present value of net market benefits of each option under all reasonable scenarios, over a 20-year period.

Table 6: Present value of net market benefits of credible options - scenarios ($M, real 2024-25)

Scenario	Do nothing		Option 1		Option 2		Option 3		Option 4	
	NPV	Ranking	NPV	Ranking	NPV	Ranking	NPV	Ranking	NPV	Ranking
Weighted	0	5	1,093	1	1,085	2	1,061	3	60.0	4
Central	0	5	1,101	1	1,093	2	1,069	3	60.6	4
Low	0	5	827	1	819	2	795	3	38.1	4
High	0	5	1,343	1	1,335	2	1,310	3	80.5	4

The RIT-D assessment summarised in Table 6 demonstrates that Option 1 maximises the present value of net market benefits under the weighted scenario (i.e. a weighting of the central, low and high scenarios).

For all reasonable scenarios considered, Option 1 maximises the present value of net market benefits for all scenarios.

Based on the weighted scenario, the preferred option for investment in the Brunswick and Fitzroy supply area is Option 1 (i.e. Offload F to CW and offload BK to WB at 11 kV). Option 1 satisfies the requirements of the RIT-D.

The robustness of the preferred option to credible changes in input variables is summarised in the sensitivity analysis results of Table 7.

Table 7: Present net market benefits of credible options - sensitivities ($M, real 2024-25)

Sensitivity for central scenario	Option 1	Option 2	Option 3	Option 4
All variables: base values	**1,101**	1,093	1,069	60.6
Maximum demand: lower bound	**984**	976	952	51.1
Maximum demand: upper bound	**1,159**	1,151	1,127	65.3
Capital and operational costs: lower bound	**1,114**	1,107	1,088	67.7
Capital and operational costs: upper bound	**1,088**	1,078	1,050	53.5
Value of customer reliability: lower bound	**868**	860	836	41.7
Value of customer reliability: upper bound	**1,334**	1,326	1,301	79.6
Discount rate: lower bound	**1,480**	1,471	1,446	93.3
Discount rate: upper bound	**829**	822	799	37.6
Asset failure rates: lower bound	**926**	918	894	46.2
Asset failure rates: upper bound	**1,276**	1,268	1,243	75.0

Option 1 has a present value of net market benefit that remains positive under all credible sensitivities, and when compared with Options 2, 3 and 4, clearly maintains its status as the preferred option under all credible sensitivities.

Although the choice of the preferred option is clear, the optimum timing of this investment is not. The economic timing of the preferred option is when the annualised value of the avoided EUE and safety risk cost (i.e. the annualised cost of the total avoided risk) exceeds the annualised cost of the preferred option. Table 8 shows the expected optimum timing of the preferred option under each reasonable scenario.

Table 8: Expected timing of the preferred option

Scenario	Annualised cost of total risk minus investment costs (‘000, real 2024-25)				Optimum timing before summer
	2026	2027	2028	2029	
Weighted	-2,252	-795	3,992	14,163	2027-28
Central	-2,251	-784	4,036	14,277	2027-28
Low	-2,306	-1,183	2,505	10,341	2027-28
High	-2,199	-428	5,391	17,757	2027-28

Under the weighted scenario, the optimum timing of Option 1 is prior to summer 2027-28 (i.e. November 2027).

1.10 Preferred Option

The preferred option (Option 1) maximises the present value of the net economic benefit to all those who produce, consume and transport electricity in the NEM, as well as that arising from changes in Australia’s greenhouse gas emissions, considering a set of reasonable state-of-the-world scenarios and their weightings. It therefore satisfies the requirements of the RIT-D.

The preferred option involves offloading F to CW and offloading BK to WB at 11 kV to allow decommissioning of F and BK.

The preferred option was tested under a range of sensitivities. In each case, Option 1 was confirmed to provide positive economic benefits and is the highest-ranked option in all sensitivities.

The optimum timing for commissioning of the preferred option is no later than November 2027.

The preferred option has a capital cost of $57.5M (real, 2024-25).

The 20-year present value of net market benefits associated with the preferred option is $1,093M (real, 2024-25).

1.11 Next Steps

This FPAR is the final stage of the RIT-D process.

In accordance with the provisions set out in clause 5.17.5, paragraph (c) of the NER, registered participants or interested parties may, within 30 days after the publication of this report, dispute the conclusions made by CitiPower in this report with the Australian Energy Regulator (AER).

Any parties raising such a dispute are also required to notify CitiPower at ritdenquiries@citipower.com.au.

If no formal dispute is raised, CitiPower will commence with the investment activities necessary to proceed with the implementation of the preferred option.

For the purposes of referencing this RIT-D, this RIT-D is referred to as the "***Brunswick and Fitzroy Supply Area Asset Condition and Capacity Constraint***” identified need.

2. Definitions

Table 9: Terms and definitions

Term	Definition
AEMO	Australian Energy Market Operator
AFAP	As Far As Practicable
BK	Brunswick Zone Substation
BTS	Brunswick Terminal Station
C	Brunswick Zone Substation
CW	Collingwood Zone Substation
DAPR	Distribution Annual Planning Report
DPAR	Draft Project Assessment Report
DSED	Demand Side Engagement Document
EUE	Expected Unserved Energy (MWh pa)
F	Fitzroy Zone Substation
FPAR	Final Project Assessment Report
J	Spencer St Zone Substation
MD	Maximum Demand
MWp	Megawatt peak
NCC	Network Control Centre
NEM	National Electricity Market
NER	National Electricity Rules
O&M	Operations and Maintenance
PD	Partial Discharge
POE	Probability of Exceedance
R	Richmond Zone Substation
RIT-D	Regulatory Investment Test for Distribution
RTS	Richmond Terminal Station
SAPS	Standalone Power System
VCR	Value of Customer Reliability ($/MWh)
WB	West Brunswick Zone Substation

Term	Definition
50POE	The forecast maximum demand has a 50% probability of exceedance (PoE). That is, the forecast maximum demand is expected, on average, to be exceeded once in two years.
10POE	The forecast maximum demand has a 10% probability of exceedance (PoE). That is, the forecast maximum demand is expected, on average, to be exceeded once in ten years.
Credible option	An option that addresses the ‘identified need’, is commercially and technically feasible, and can be implemented in sufficient time to meet the ‘identified need’.
Identified need	Any capacity, voltage, or safety limitation on the distribution system.
Limitation	Any limitations on the operation of the distribution system that will give rise to Expected Unserved Energy or safety risk consequences.
Network option	A means by which an ‘identified need’ can be fully or partly addressed by expenditure on distribution network assets.
Non-network or SAPS option	A means by which an ‘identified need’ can be fully or partially addressed other than by a network option.
Non-network service provider	A party who provides a non-network or SAPS option.
Potential credible option	An option has the potential to be a credible option based on an initial assessment of its ability to address the ‘identified need’.
Preferred network option	A credible network option that maximises the present value of net economic benefit to all those who produce, consume and transport electricity in the NEM. The preferred network option can be a network option, or do nothing (i.e. status quo).
Preferred option	A 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 can be a network option, non-network or SAPS option, combination of both, or do nothing.

3. Introduction

CitiPower is a regulated Victorian electricity distribution business. It distributes electricity to around 349,000 homes and businesses in Melbourne's central business district (CBD) and inner suburbs.

The CitiPower electricity distribution network consists of around 57,491 poles and over 8,019 kilometres of overhead lines and underground cables. Electricity is received via 70 sub-transmission lines at 33 zone substations, where it is transformed from sub-transmission voltages down to distribution voltages.

The area of CitiPower's electricity distribution network that is the subject of this Regulatory Investment Test for Distribution (RIT-D) is the Brunswick and Fitzroy supply area. The need for investment and the possible options for addressing the identified need within this supply area, have been flagged in CitiPower's 2024 Distribution Annual Planning Report (DAPR)[4], and detailed in our Notice of Determination and Draft Project Assessment reports (DPAR) published in January 2025 associated with this RIT-D.

This Final Project Assessment Report (FPAR) has been prepared by CitiPower in accordance with the requirements of clause 5.17.4, paragraph (r) of the National Electricity Rules (NER) version 230, and is consistent with the Australian Energy Regulator's (AER) RIT-D Application Guidelines[5] and the Industry Practice Application Note for Asset Replacement Planning[6].

The publication of this FPAR represents the final stage of the consultation process in relation to the application of the RIT-D for addressing the identified need, associated with the network safety and reliability of supply risks within the Brunswick and Fitzroy supply area.

The NER requires that the FPAR includes matters detailed in NER clause 5.17.4, paragraph (j) as follows:

- provide background information on the network servicing the Brunswick and Fitzroy supply area and its limitations
- describe the need which CitiPower is seeking to address, together with the assumptions used in identifying that need
- provide a summary of, and commentary on, the submissions on the DPAR
- describe the credible options that are considered in this RIT-D assessment
- describe the methods used in quantifying each material market benefit
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- quantify costs, high-level cost breakdowns, and material market benefits for each of the credible options
- present the results of a net present value (NPV) analysis, with explanatory statements regarding the results
- confirm the preferred option, its costs, optimum timing and its technical characteristics.

[4] CitiPower: Distribution Annual Planning Report. Available at: https://media.powercor.com.au/wp-content/uploads/2024/12/31085532/DAPR_2024_Citipower_Distribution-Annual-Planning-Report-1.zip

[5] AER: "AER – RIT-D Application Guidelines – November 2024". Available at: https://www.aer.gov.au/system/files/2025-05/AER%20-%20Regulatory%20Investment%20Test%20for%20Distribution%20application%20guidelines%20-%202024%20-%20Version%206.pdf

[6] AER: "AER – Industry Practice Application Note – Asset Replacement Planning – January 2019". Available at: https://www.aer.gov.au/system/files/D19-2978%20-%20AER%20-Industry%20practice%20application%20note%20Asset%20replacement%20planning%20-%2025%20January%202019.pdf

4. Identified need

4.1 Network overview

The Brunswick and Fitzroy supply area is serviced by Brunswick (BK) and Fitzroy (F) zone substations. The power supply coverage of BK (orange) and F (green) is illustrated in Figure 1. The BK supply area is bounded approximately by Merri Creek in the east, Moreland Rd in the north, Blyth St in the south and the Upfield railway line in the west. The F supply area is bounded approximately by Merri Creek in the north, Yarra River in the east, Alexander Parade in the south and Nicholson St in the west.

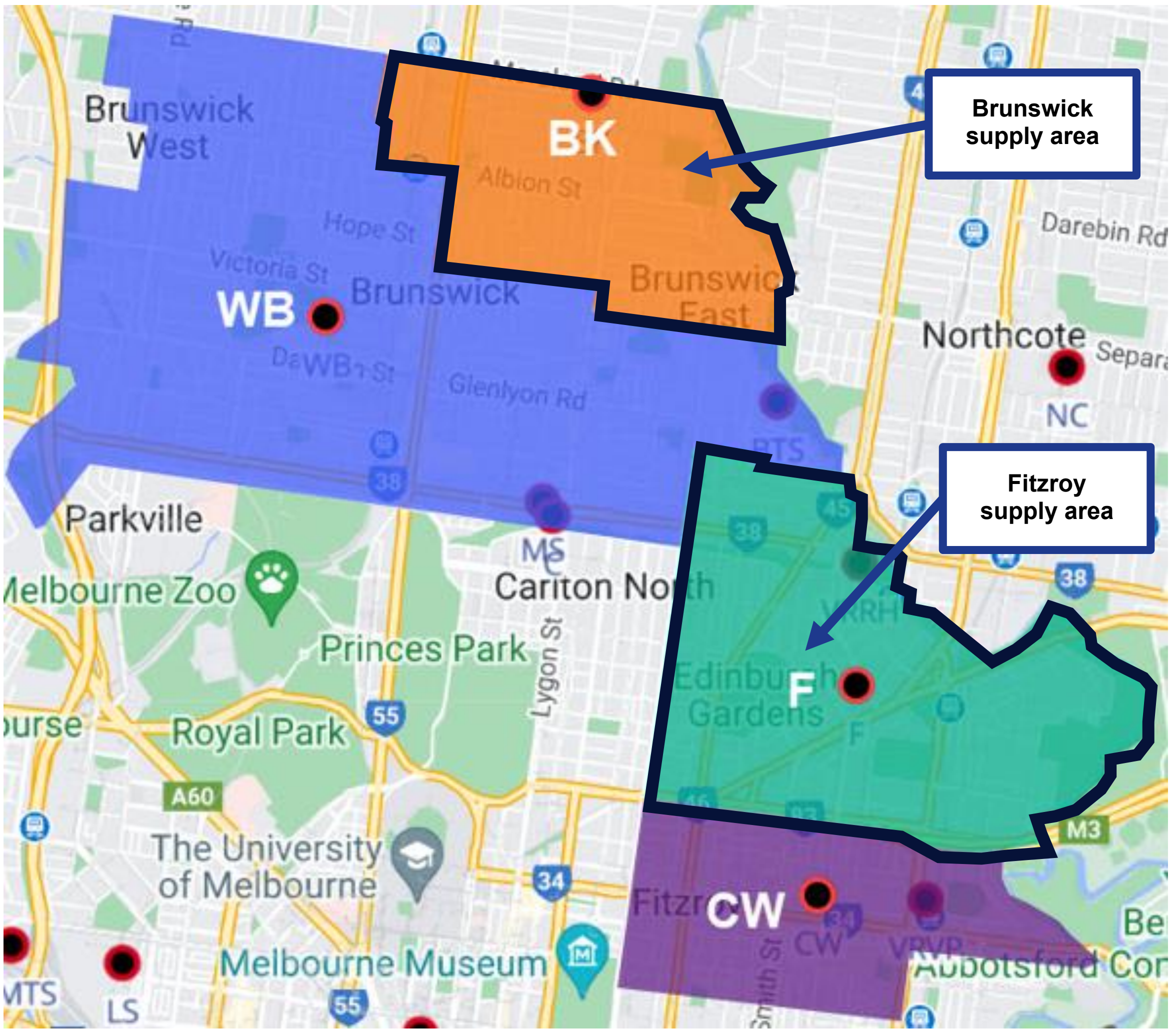

Figure 1: Brunswick and Fitzroy supply area

BK and F are owned and operated by CitiPower, providing power to approximately 8,175 and 8,593 customers respectively. The majority of the load at BK and F comprises of high-density residential and commercial customers.

BK is supplied by three 22 kV overhead sub-transmission lines from Brunswick Terminal Station (BTS). BK has three radially-connected 22/6.6 kV transformers each rated at 10/13 MVA, with one of those transformers on a hot standby arrangement. For this reason, the N and N-1 ratings of BK are the same, being 27.2 MVA (summer) and 28.6 MVA (winter).

F is supplied by three 22 kV underground sub-transmission cables from BTS but one of those cables is permanently out of service due to its condition. F zone substation therefore has available, two radially-connected 22/6.6 kV transformers each rated at 10/13 MVA. The N rating of F is 30.2 MVA (summer) and 35.2 MVA (winter), and the N-1 ratings are 13.5 MVA (summer) and 15.3 MVA (winter).

The sub-transmission single line diagram of the Brunswick and Fitzroy supply area, is illustrated in Figure 2

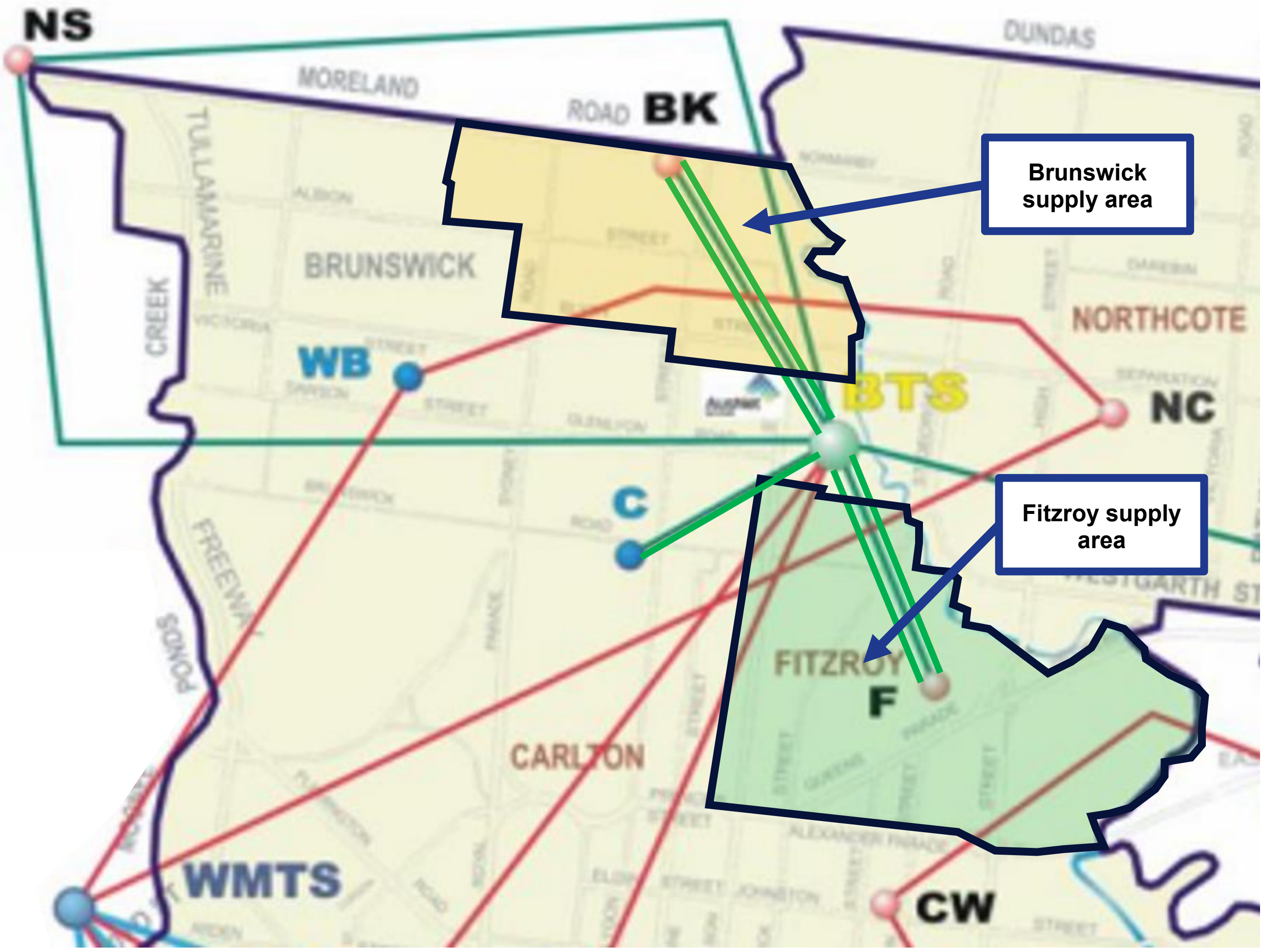

Figure 2: Brunswick and Fitzroy supply area sub-transmission single line diagram

The N rating of the BTS-BK sub-transmission system is 31.1 MVA (summer) and 31.1 MVA (winter), and its N-1 rating is 20.6 MVA (summer) and 20.6 MVA (winter).

The N rating of the BTS-F sub-transmission system is 26.1 MVA (summer) and 27.4 MVA (winter), and its N-1 rating is 12.0 MVA (summer) and 12.6 MVA (winter).

4.2 Description of the Identified Need

CitiPower has identified emerging capacity limitations within the Brunswick and Fitzroy supply area over the next 10-years. These capacity limitations are on ageing network assets, that have reached end of life and present a safety risk. These forecast limitations are detailed below.

4.2.1 Asset Condition

Two of the three 22/6.6 kV transformers at BK are ageing and are identical units to those at F zone substation, having the potential for a similar thermal defect to emerge, with the units over 70 years old.

F and BK zone substations each have one newer (2011) transformer which is an identical unit to the Richmond (R) zone substation No 3 Transformer. The other two transformers at Sub R are identical units to the 1940s units at F and BK and will also require replacement in the medium term. There is potential to reuse the newer (2011) transformers from BK and F at R, at the time when BK and F are rebuilt or decommissioned.

The No. 2 transformer at F has been declared permanently out of service due to oil analysis indicating an internal thermal defect. The F No. 3 Transformer may also be susceptible to this condition, which was also observed on identical units at Spencer St (J) zone substation before it was decommissioned.

The 6.6 kV switchgear at F zone substation was manufactured in the 1940s and has compound filled busbars, that in the event of failure, pose a significant safety hazard and are considered unrepairable. The 6.6 kV circuit breakers are manually charged units that also require hand applied earths. The circuit breakers have experienced an increasing number of defects in recent years and their older design does not include modern safety features.

The 6.6 kV switchgear is not suitable for uprating to 11 kV and limits the options for augmentation at the site.

BK has three 6.6/11 kV auto-transformers for supplying 11 kV feeders. Oil containment requires improvement on the No. 3 auto-transformer to maintain compliance. Their overall asset health requires intervention.

The 22 kV sub-transmission underground cables from BTS to F have experienced multiple faults in recent years and one cable is permanently out of service.

Most of the protection relays are types targeted for replacement due to obsolescence and reliability issues.

Overall, the asset health at BK and F requires intervention.

4.2.2 Sub-transmission Capacity Limitations

Table 10 presents the ratings, and Table 11 the forecast maximum demand (MD) and capacity limitations for sub-transmission supply to BK. Values in red violate the N-1 secure rating, and values in **bold red** reach the N rating.

Table 10: BK sub-transmission ratings

Summer		Winter	
N-1 secure	**N**	**N-1 secure**	**N**
20.6	31.1	20.6	31.1

Table 11: BK sub-transmission forecast maximum demand and capacity limitations

Year	Summer		Winter	
MVA	**50 POE MD**	**10 POE MD**	**50 POE MD**	**10 POE MD**
2025	14.7	15.9	16.7	17.6
2026	15.2	16.5	17.9	18.9
2027	15.9	17.2	19.3	20.3
2028	16.9	18.3	20.9	22.0
2029	18.0	19.5	22.8	24.0
2030	19.4	21.0	24.9	26.1
2031	20.8	22.5	26.6	28.0
2032	22.3	24.1	28.3	29.8
2033	23.8	25.7	30.1	**31.6**
2034	25.3	27.4	31.5	**33.1**

There is insufficient capacity in the sub-transmission supply to BK for N-1 contingency conditions from 2028, and its N normal conditions from 2033.

Table 12 presents the ratings, and Table 13 the forecast maximum demand (MD) and capacity limitations for sub-transmission supply to F. Values in red violate the N-1 secure rating, and values in **bold red** reach the N rating.

Table 12: F sub-transmission ratings

Summer		Winter	
N-1 secure	**N**	**N-1 secure**	**N**
12.0	21.6	12.6	27.4

Table 13: F sub-transmission forecast maximum demand and capacity limitations

Year	Summer		Winter	
MVA	**50 POE MD**	**10 POE MD**	**50 POE MD**	**10 POE MD**
2025	14.6	16.0	17.6	18.6
2026	15.2	16.7	18.8	19.8
2027	16.1	17.7	20.3	21.4
2028	17.3	19.0	22.0	23.2
2029	18.6	20.4	23.9	25.1
2030	20.1	**22.1**	25.9	27.2
2031	**21.7**	**23.8**	**27.7**	**29.2**
2032	**23.3**	**25.6**	**29.6**	**31.2**
2033	**25.0**	**27.4**	**31.5**	**33.2**
2034	**26.8**	**29.5**	**33.1**	**34.8**

There is insufficient capacity in the sub-transmission supply to F under N-1 contingency conditions during the entire 10-year planning horizon. Furthermore, there is insufficient capacity for N normal conditions, from 2029-30.

4.2.3 Zone substation capacity limitations

Table 14 presents the ratings, and Table 15 the forecast maximum demand (MD) and capacity limitations for BK zone substation. Values in red violate the N-1 rating, and values in **bold red** reach the N rating.

Table 14: BK zone substation ratings

Summer		Winter	
N-1	**N**	**N-1**	**N**
27.2	27.2	28.6	28.6

Table 15: BK zone substation forecast maximum demand and capacity limitations

Year	Summer		Winter	
MVA	**50 POE MD**	**10 POE MD**	**50 POE MD**	**10 POE MD**
2025	14.7	15.9	16.7	17.6
2026	15.2	16.5	17.9	18.9
2027	15.9	17.2	19.3	20.3
2028	16.9	18.3	20.9	22.0
2029	18.0	19.5	22.8	24.0
2030	19.4	21.0	24.9	26.1
2031	20.8	22.5	26.6	28.0
2032	22.3	24.1	28.3	**29.8**
2033	23.8	25.7	**30.1**	**31.6**
2034	25.3	**27.4**	**31.5**	**33.1**

There is insufficient capacity at BK for N (normal) and N-1 (contingency) conditions during the 10-year planning horizon starting from 2032 for a 10 POE winter maximum demand and the following year for a 50 POE winter maximum demand, and from 2033-34 for a 10 POE summer maximum demand.

Table 16 presents the ratings, and Table 17 the forecast maximum demand (MD) and capacity limitations for F zone substation. Values in red violate the N-1 rating, and values in **bold red** reach the N rating.

Table 16: F zone substation ratings

Summer		Winter	
N-1	**N**	**N-1**	**N**
13.5	30.2	15.3	35.2

Table 17: F zone substation forecast maximum demand and capacity limitations

Year	Summer		Winter	
MVA	**50 POE MD**	**10 POE MD**	**50 POE MD**	**10 POE MD**
2025	14.6	16.0	17.6	18.6
2026	15.2	16.7	18.8	19.8
2027	16.1	17.7	20.3	21.4
2028	17.3	19.0	22.0	23.2
2029	18.6	20.4	23.9	25.1
2030	20.1	22.1	25.9	27.2
2031	21.7	23.8	27.7	29.2
2032	23.3	25.6	29.6	31.2
2033	25.0	27.4	31.5	33.2
2034	26.8	29.5	33.1	34.8

There is insufficient capacity at F under N-1 contingency conditions during the entire 10-year planning horizon.

4.2.4 Summary of Identified Need

The identified need for the Brunswick and Fitzroy supply area is to address the:

- safety and reliability of supply risks associated with the ageing 6.6 kV switchboards, 22/6.6 kV transformers, 11/6.6 kV auto-transformers, 22 kV sub-transmission cables and secondary systems at BK and F
- reliability of supply risks at BK and F, due to the lack of network capacity during normal conditions (N)
- reliability of supply risks at BK and F, due to the lack of network capacity from limited load transfer capability between zone substations, during single contingency conditions (N-1).

Solutions to the identified need shall manage and mitigate the forecast increases of expected unserved energy (EUE) resulting from load at risk capacity limitations caused by maximum demand growth, lack of load transfer capacity and ageing asset condition at BK and F. Solutions are needed to maintain reliability of electricity supply to CitiPower's customers, and to meet our safety obligations.

4.3 Quantification for the identified need

Table 18 summarises the forecast impact of the identified network needs discussed in Section 4.2 on customers. The table shows over a 10-year forecasting period, the safety (asset condition related) and reliability of supply (asset capacity overload related) risk costs, being the potential market benefits considered for this RIT-D.

Table 18: Summary of risk costs ($'000, real 2024-25)

Year	Safety (asset condition)	EUE (capacity overload)	Total risk cost
2025	171	0	**171**
2026	176	121	**296**
2027	182	1,581	**1,763**
2028	191	6,392	**6,583**
2029	202	16,622	**16,824**
2030	216	34,228	**34,444**
2031	234	52,856	**53,090**
2032	255	76,699	**76,954**
2033	283	106,886	**107,169**
2034-46	322	140,306	**140,628**

The reliability of supply risk (EUE) cost is the value of the energy at risk after taking into account the probability and duration of forced outages of network assets at BK, F and their upstream sub-transmission circuits and load transfer capacity, representing the deterioration in supply reliability within the Brunswick and Fitzroy supply area. The EUE has been weighted 30% to the 10 POE maximum demand forecast, and 70% to the 50 POE maximum demand forecast using the value of customer reliability (VCRs) presented in Section 8.1.2.

The safety risk cost is the expected value of safety incidents associated with ageing network asset condition at BK and F representing the deterioration in safety. No disproportionality factor has been applied to the safety risk cost.

For the purposes of this RIT-D, economic evaluations are undertaken over a 20-year period. Table 19 provides a summary of the base case option, using the risk costs presented in Table 18.

Table 19: Base case

Option	Description
Do nothing (status quo)	This base case option involves continuing to operate the existing poor condition network assets within the supply area under the forecast maximum demands. That is, no expenditure is incurred, and any capacity shortfalls or asset condition failures are addressed through customer load shedding. The present value of all costs (safety and EUE risk) is $1,188M (real, 2024-25).

5. Key assumptions in relation to the identified need

5.1 Method of quantifying the identified need

CitiPower's reliability planning standard for its zone substation and sub-transmission assets is based on a probabilistic planning approach which quantifies reliability of supply as expected unserved energy (EUE) defined in terms of megawatt hours (MWh) per annum of energy not supplied. This measure considers the unavailability of an asset (defined by its forced outage failure rate and its outage duration), and the load transfer capacity, expressing this financially by applying a (VCR) ($/MWh).

5.2 Forecast maximum demand

Our forecasts of maximum demand and capacity limitations for summer and winter for 10 POE and 50 POE weather conditions are presented in Section 4.2, for BK and F zone substations, and their associated sub-transmission supplies.

5.3 Forecast annual energy

The net annual energy requirements of customers within the Brunswick and Fitzroy supply area as shown in Table 20.

Table 20: Brunswick and Fitzroy supply area net annual energy (GWh p.a.)

Year	BK supply area	F supply area	Total
2025	67.4	65.2	132.6
2026	72.2	69.7	141.9
2027	77.6	75.2	152.8
2028	84.2	81.4	165.5
2029	91.8	88.2	180.1
2030	100.0	95.6	195.7
2031	107.1	102.6	209.6
2032	114.0	109.5	223.5
2033	121.0	116.5	237.5
2034	126.8	122.3	249.0

5.4 Characteristic of load profile

CitiPower has prepared load profiles that are characterised using profiles from the most recent 50 POE year.

The coincident maximum demand of the customers within the Brunswick and Fitzroy supply area occurs during days of extreme ambient temperature. The annual demand profile of BK and F expressed as a percentage of the 50 POE maximum demand listed in Section 4.2, is illustrated in Figure 3 and Figure 4 respectively.

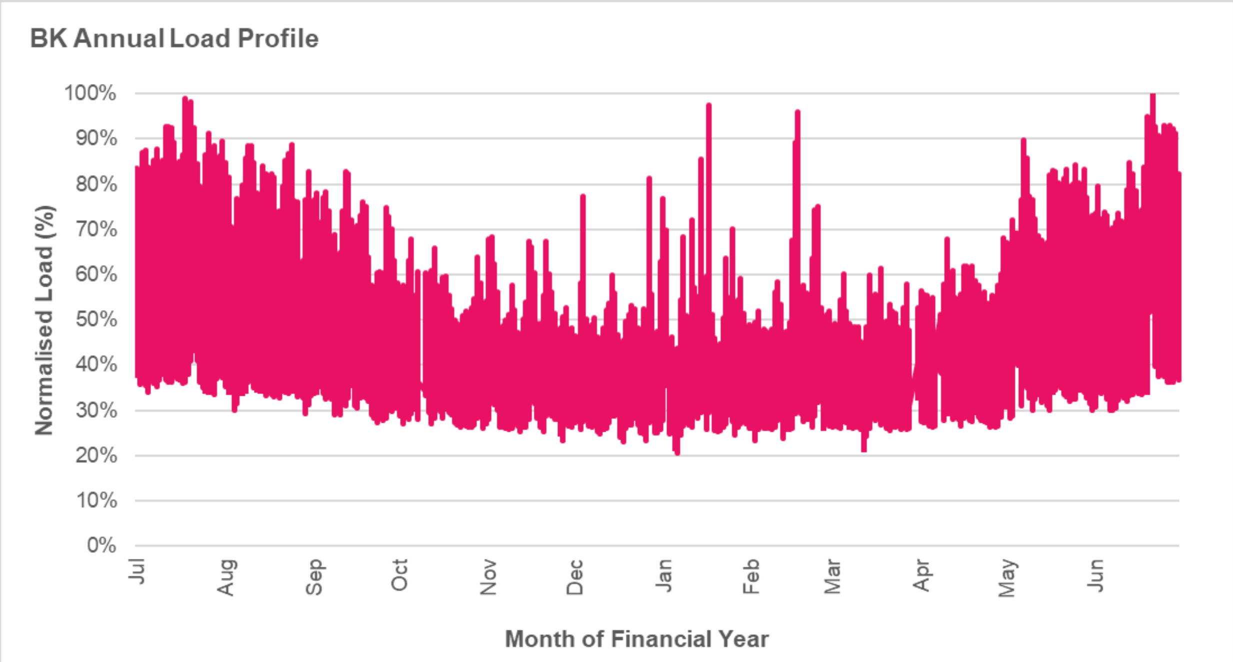

Figure 3: Annual load profile at BK

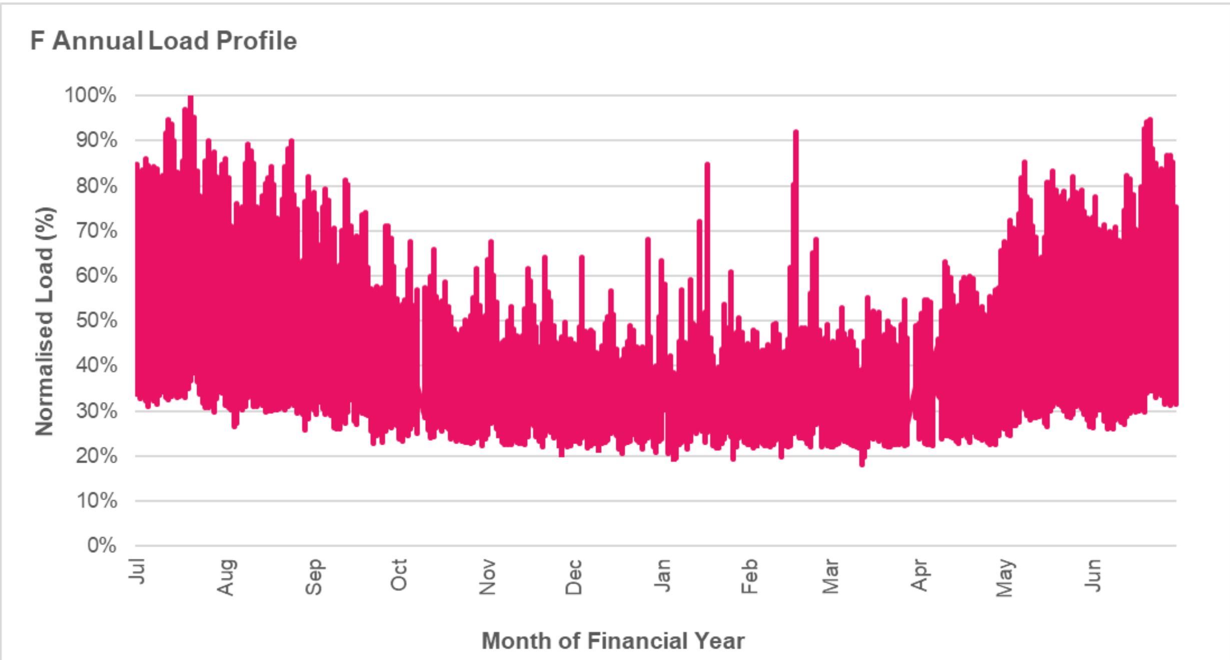

Figure 4: Annual load profile at F

The load profile on the day of a 50 POE summer maximum demand is illustrated in Figure 5 and Figure 6 for BK and F respectively. The prominence of residential load and solar photo voltaic (PV) generation within the BK and F supply area, results in a maximum demand occurring during early evening.

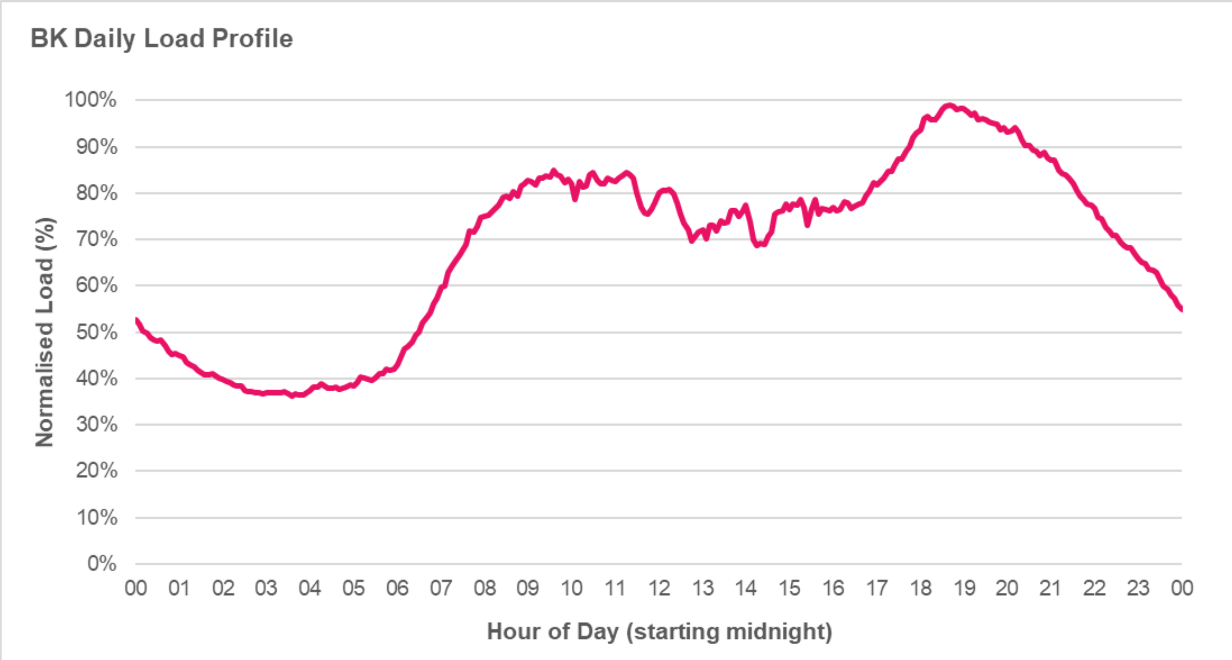

Figure 5: Load profile on day of summer maximum demand at BK

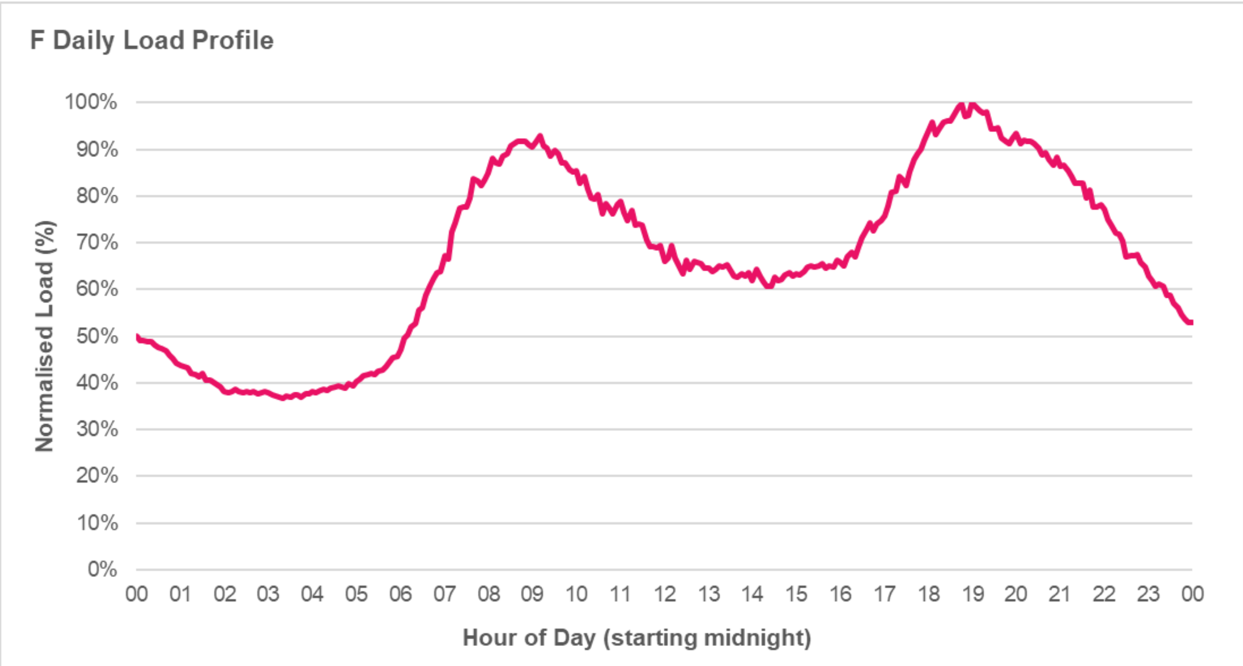

Figure 6: Load profile on day of summer maximum demand at F

Figure 7 and Figure 8 shows the normalised BK and F annual load-duration curve for a 50 POE summer maximum demand year.

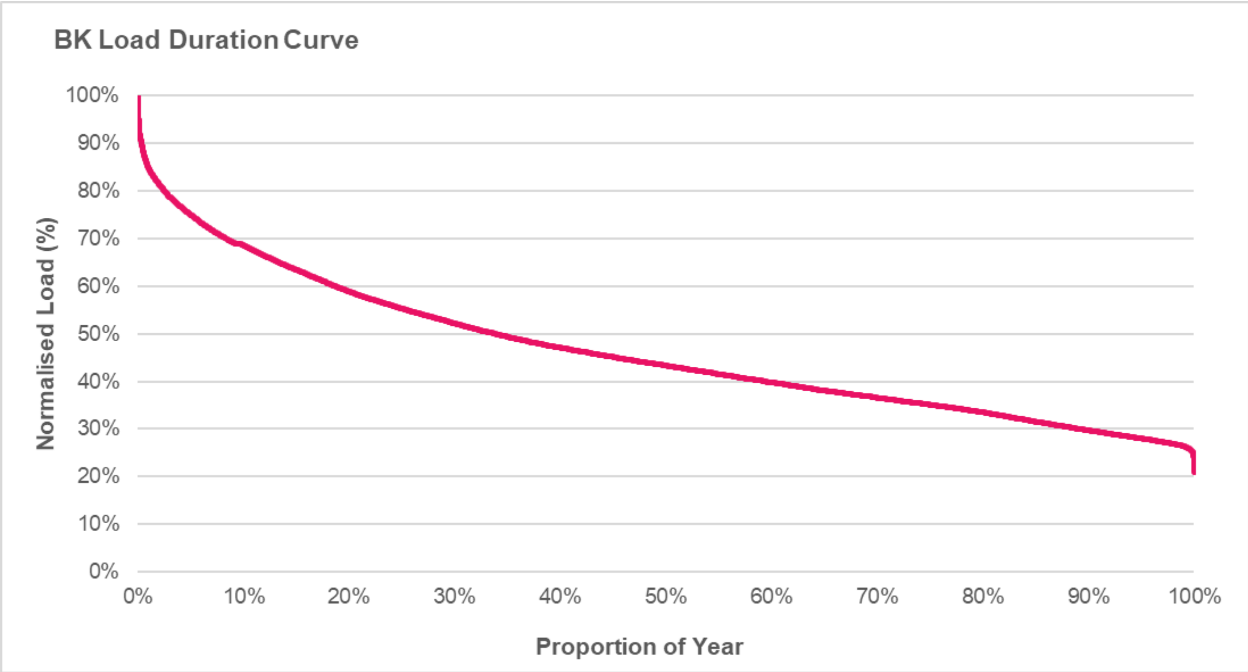

Figure 7: Annual load duration curve at BK

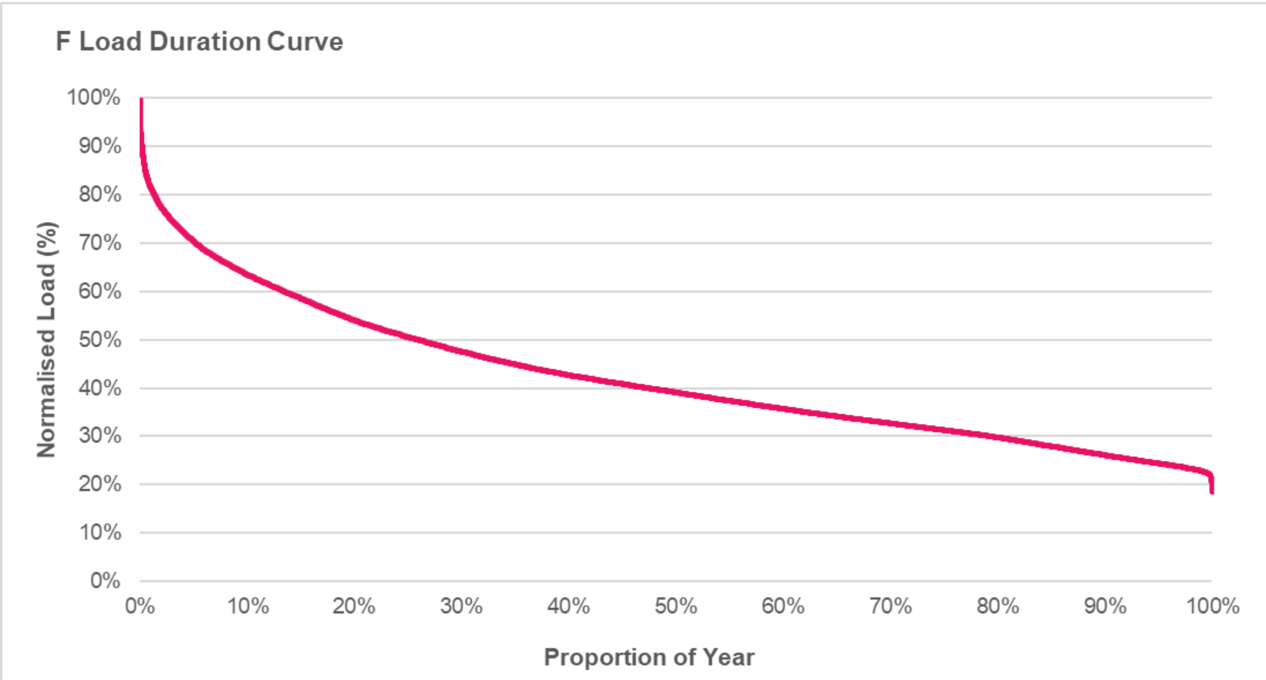

Figure 8: Annual load-duration curve at F

The load characteristics can vary marginally from year to year due to changes in weather, solar PV uptake, and underlying changes in the customers’ load usage. The figures show that load in excess of 80% of the maximum demand lasts for less than 3% of the year. It also shows that BK and F have a high penetration of air conditioning cooling which operates for a very small fraction of the year.

5.5 Load transfer capacity and supply restoration times

The load transfer capability (to WB) is listed in Table 21.

Table 21: Load transfer capacity (MVA)

Year	Summer		Winter	
MVA	**BK**	**F**	**BK**	**F**
2025	4.4	4.4	4.1	4.4
2026	4.3	4.3	3.9	4.1
2027	4.2	4.2	3.8	3.8
2028	4.1	4.2	3.6	3.4
2029	4.1	4.0	3.4	3.1
2030	4.0	3.8	3.2	2.8
2031	3.8	3.7	3.0	2.4
2032	3.7	3.5	2.8	2.0
2033	3.6	3.3	2.5	1.6
2034	3.5	3.1	2.3	1.3

Customer supply is normally restored within 60 minutes (on average) following the loss of a plant item causing an outage.

5.6 Network Asset Ratings

Refer to Section 4 for details on asset ratings and spare capacity.

5.7 Network Asset Failure Rates

Sub-transmission cable failure rates are assumed to be 1% per km per annum with a 5-hour repair time. Zone substation power transformer and switchboard failure rates are assumed to be 1% per annum with a 2.65-month repair time.

6. Submissions on the Draft Report

A RIT-D consultation was undertaken on the Draft Project Assessment Report (DPAR) published on CitiPower's website in January 2025. This report was prepared to present the economic evaluation of the potential credible options being considered. It was concluded from the analysis presented in that report that Option 1 is the proposed preferred solution for addressing the identified need within the Brunswick and Fitzroy supply area.

CitiPower did not receive any submissions or proposals for alternative non-network or SAPS solutions during that consultation period.

7. Credible options

CitiPower presented nine options (network, non-network and SAPS) in the Notice of Determination and DPAR reports published in January 2025. Only four network options were regarded as being credible for the reasons set out in that report. Details of the credible options that are assessed in this RIT-D against the base case are presented in Table 22.

Table 22: Credible options

Option	Description
1. Offload F to CW and offload BK to WB at 11 kV	This option converts the 6.6 kV distribution network to 11 kV and offloads F to CW, and BK to WB at 11 kV in their entirety. This allows BK and F and their 22 kV sub-transmission network to be decommissioned. The total capital cost of this option is \$57.5M (real, 2024-25). The present value of all costs (capital, O&M, safety and EUE risk) is \$87.0M (real, 2024-25).
2. Install 3rd 66/11 kV transformer at CW as part of offload of F to CW and BK to WB at 11 kV	This option undertakes Option 1 plus the installation of a 3rd 66/11 kV transformer at CW. The total capital cost of this option is \$64.5M (real, 2024-25). The present value of all costs (capital, O&M, safety and EUE risk) is \$95.3M (real, 2024-25).
3. Rebuild C as a 66/11 kV zone substation and offload BK and F to C at 11 kV	This option rebuilds the decommissioned C zone substation to 66/11 kV, converting the 6.6 kV distribution network to 11kV, and offloads F and BK to C at 11kV in their entirety. This allows BK and F and their 22 kV sub-transmission network to be decommissioned. The total capital cost of this option is \$77.7M (real, 2024-25). The present value of all costs (capital, O&M, safety and EUE risk) is \$119.2M (real, 2024-25).
4. Asset replacement at BK and F (in-situ)	This option replaces all ageing condition equipment at BK and F (in-situ), including the 6.6 kV switchboards and 22/6.6 kV transformers, retaining the existing distribution network voltage at 6.6 kV. This option allows BK and F to continue to remain in service. The total capital cost of this option is \$30.9M (real, 2024-25). The present value of all costs (capital, O&M, safety and EUE risk) is \$1,127M (real, 2024-25).

The purpose of the RIT-D is to identify the preferred option, being the credible option that maximises the present value of net market benefit to all those who produce, consume and transport electricity in the NEM, as well as that arising from changes in Australia's greenhouse gas emissions. To quantify the net market benefits of each credible option, the value of EUE and safety risk cost under the base case (where no action is taken by CitiPower) is compared against the value of EUE and safety risk cost with each of the credible options in place.

8. Market modelling methodology

The RIT-D requires market benefits identified to be material, to be calculated by comparing the state-of-the-world in the base case (where no action is undertaken by CitiPower), against each of the credible options in place. The states-of-the-world are a range of reasonable and mutually consistent scenarios of credible supply and demand characteristics and conditions that may affect the calculation of the market benefits over the period of assessment. The selection of the preferred option is informed by a weighting of all the reasonable scenarios.

Furthermore, a set of sensitivity studies is undertaken on the preferred option by varying key input variables, to test the economic viability and rank of the preferred option against other options and the base case, for all credible changes in assumptions.

8.1 Key parameters

8.1.1 Discount rates

To compare cash flows of options with different time profiles, it is necessary to use a discount rate to express future costs and benefits in present value terms. The choice of discount rate will impact on the estimated present value of net market benefits and may affect the ranking of alternative options. A discount rate of 4.43 per cent is used.

8.1.2 Assessment period

The RIT-D economic analysis has been undertaken over a 20-year period, commensurate with the long-lived nature of the investments considered in this RIT-D assessment. For simplicity, the risk modelling for calculation of market benefits is calculated across a forecast horizon up to 2034. The market benefits calculated in 2034 has been applied as the assumed annual market benefit that would continue to arise until the end of the 20-year period.

8.1.3 Value of customer reliability

Location-specific VCR is used to value reliability of supply. The locational VCR for the BK and F supply area was derived from the sector VCR estimates provided by the AER, weighted in accordance with the composition of the load, by sector, and escalated by CPI. This is summarised in Table 23.

Table 23: Summary of location specific VCR

Zone substation	VCR ($ per MWh, real 2024-25)
BK	40,802
F	37,046

8.1.4 Value of safety consequence

Values of safety consequence used in this RIT-D are derived from various sources including Safe Work Australia[7] for LTI, and the Department of Prime Minister and Cabinet, Best Practice Regulation Guidance Note[8] for VSL, (adjusted to real 2024-25). These values of safety consequence are summarised in Table 24.

Table 24: Summary of safety consequence values

Safety consequence	Value of safety consequence ($'000, real 2024-25)
Injury (LTI)	154
Death (VSL)	5,492

[7] Safe Work Australia, The Cost of Work-related Injury and Illness for Australian Employers, Workers and the Community: 2012-13. Available at: https://www.safeworkaustralia.gov.au/system/files/documents/1702/cost-of-work-related-injury-and-disease-2012-13.docx.pdf.

[8] Department of the Prime Minister and Cabinet, Australian Government, Best Practice Regulation Guidance Note: Value of statistical life. Available at: https://oia.pmc.gov.au/resources/guidance-assessing-impacts/value-statistical-life.

8.2 Classes of market benefits considered material

The purpose of the RIT-D is to identify the credible option that maximises the present value of net market benefits to all those who produce, consume and transport electricity in the NEM, as well as that arising from changes in Australia's greenhouse gas emissions.

To measure the increase in net market benefit, CitiPower has analysed the classes of market benefits required to be considered by the RIT-D[9]. The classes of market benefits that are considered material and have been quantified in this RIT-D assessment are:

- changes in safety risk costs[10]
- changes in involuntary load shedding.

8.2.1 Changes in safety risk cost

Reducing the likelihood of asset failure by addressing ageing condition assets provide a better safety outcome for the supply area, by reducing potential safety incidents and the consequential risk of harm to CitiPower's personnel and the wider community. At BK and F, the safety risk cost is considered material.

8.2.2 Changes in involuntary load shedding

Reducing the likelihood of asset overload provides a greater reliability for the supply area, by reducing potential supply interruptions and the consequential risk of involuntary load shedding. At BK and F, the reliability of supply risk cost (expressed as the value of EUE is considered material.

8.3 Classes of market benefits not expected to be material

CitiPower considers that the following classes of market benefit are not likely to be material for this RIT-D assessment:

- changes in load transfer capacity and the capacity of embedded generating units to take up load
- changes in electrical energy losses
- changes in voluntary load curtailment
- changes in costs to other parties
- changes in Australia's greenhouse gas emissions
- difference in timing of expenditure
- additional option value.

8.3.1 Changes in load transfer capacity and the capacity of embedded generating units

The modelling undertaken in Section 8.2.2 considers load transfers that may be expected to occur with each of the credible options in place. Changes in load transfer capability is not expected to be materially different between any of the credible options considered, or with the base case. Changes in the capacity of embedded generating units to take up load is not expected to be materially different between any of the credible options considered, or with the base case.

8.3.2 Changes in electrical energy losses

The differences in electrical energy losses between credible options and with the base case is considered negligible.

8.3.3 Changes in voluntary load curtailment

Voluntary load curtailment is where customers agree to voluntarily curtail their electricity under certain circumstances, such as during a network asset outage event. The customer will typically receive an agreed payment for making load

[9] NER: clause 5.17.1(c) paragraph 4.

[10] CitiPower notes that use of a safety risk cost as a class of market benefit is consistent with practice notes provided by the AER, and is the approach taken by other network service providers within the NEM. Refer to: "AER – Industry Practice Application Note – Asset Replacement Planning – January 2019". Available at: https://www.aer.gov.au/system/files/D19-2978%20-%20AER%20-Industry%20practice%20application%20note%20Asset%20replacement%20planning%20-%2025%20January%202019.pdf

available for curtailment, and for having it curtailed during a network event. A credible demand-side reduction option leads to a change in the amount of voluntary load curtailment.

In its Notice of Determination report, CitiPower assessed the potential for voluntary load curtailment within the Brunswick and Fitzroy supply area. It was identified from that report that the potential for voluntary load curtailment was immaterial to address the identified need. Therefore, this market benefit is not quantified for this RIT-D, as it was not material to differentiate between credible options, or with the base case.

8.3.4 Changes in costs to other parties

There are no material market benefits or costs to other parties.

8.3.5 Changes in Australia's greenhouse gas emissions

The credible options are not expected to create any material difference to Australia's greenhouse gas emissions. The rationale for there being no impact on greenhouse gas emissions is that the options are not expected to impact wholesale market generation dispatch, renewable energy curtailment or levels of SF_6 emissions from high-voltage switchgear.

8.3.6 Difference in timing of expenditure

CitiPower has determined that the timing of other unrelated expenditure is not impacted by the options considered in this assessment. Therefore, this market benefit is not quantified, as it was not considered to be relevant to differentiate between options that address the need within the Brunswick and Fitzroy supply area.

8.3.7 Additional option value

Additional 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 if the credible options considered by CitiPower are sufficiently flexible to respond to that change.

In the context of the Brunswick and Fitzroy supply area, it is noted that a key identified need relates to safety. As there is virtually no uncertainty in the condition of the assets approaching end of life, and that the current condition of the assets is not tenable under the AFAP principle, there is little value in retaining flexibility.

CitiPower considers that the estimation of any option value benefits captured via the scenario analysis and comparison of the credible option under those scenarios would be adequate to meet the NER requirements to consider option value as a class of market benefit.

CitiPower therefore does not propose to estimate any additional option value market benefit for this RIT-D assessment.

8.4 Option costs

CitiPower has estimated the capital costs of the credible options, based on actual costs from previous projects of a similar nature. They have been developed in-house by project estimators. CitiPower estimates that the actual cost is within +/- 20 per cent of the capital cost used within this RIT-D. The capital and operating cost assumptions for each credible option considered in this RIT-D assessment are summarised in Table 25.

Table 25: Capital and Operating Costs of Credible Options ($'000, real 2024-25)

Option	Capital cost	Operational cost (p.a.)
Base case - do nothing	0	0
Option 1 - Offload F to CW and offload BK to WB at 11 kV	57,500	0
Option 2 - Install 3rd 66/11 kV transformer plus Option 1	64,500	70
Option 3 - Rebuild C as a 66/11 kV zone substation and offload BK and F to C at 11 kV	77,700	777
Option 4 - Asset replacement at BK and F (in-situ)	30,900	0

The 20-year present value of capital, operating and risk costs for each credible option considered in this RIT-D assessment are summarised in Table 26.

Table 26: Present value of costs of credible options ($'000, real 2024-25)

Option	Capital cost	Operational cost	Investment cost (net)	Risk cost	Total cost
Base case - do nothing	0	0	0	1,188,036	1,188,036
Option 1 - Offload F to CW and offload BK to WB at 11 kV	67,204	0	67,204	19,843	87,047
Option 2 - Install 3rd 66/11 kV transformer plus Option 1	72,764	918	73,682	21,574	95,256
Option 3 - Rebuild C as a 66/11 kV zone substation and offload BK and F to C at 11 kV	86,196	9,392	95,587	23,658	119,245
Option 4 - Asset replacement at BK and F (in-situ)	35,443	0	35,443	1,091,986	1,127,429

8.5 Scenarios

Clause 5.17.1 paragraph (c)(1) of the NER requires the RIT-D to be based on a cost-benefit analysis that considers a number of reasonable state-of-the-world scenarios of future supply and demand.

The development of additional reasonable scenarios applied by CitiPower for this RIT-D involved a process of applying a credible sensitivity on key input variables around a central scenario, to identify a credible low scenario and a credible high scenario. A weighting is then assigned to each of the three scenarios, representing the likelihood of each of these state-of-the-world scenarios materialising. The weighted scenario is then used to identify the preferred option, as it inherently considers the uncertainty associated with different future states-of-the-world.

For the identified need in this RIT-D assessment, the major input variables that impact future reliability and safety outcomes within the Brunswick and Fitzroy supply area, are changes in the demand for electricity, and changes in the asset failure rates. Table 27 lists the variables and ranges adopted for the purpose of defining scenarios.

Table 27: Scenario variables and weightings

Scenario Definition	Low scenario	Central scenario	High scenario
Weighting	25%	50%	25%
Maximum demand	90%	100%	105%
Asset failure rate	85%	100%	115%

8.6 Sensitivities

To test the robustness of the RIT-D preferred option to changes in assumptions, a set of sensitivities to key input variables to the analysis has been applied. Table 28 lists the variables and ranges adopted for the purpose of informing sensitivity analysis.

Table 28: Sensitivity analysis variables

Sensitivity testing	Lower bound	Base value	Upper bound
Maximum demand	90%	100% - Refer Section 4.2	105%
Capital and operational costs	80%	100% - Refer Section 8.4	120%
Value of customer reliability	80%	100% - Refer Section 8.1.2	120%
Discount rate	2.22%	4.43% - Refer Section 8.1.1	6.65%
Asset failure rates	85%	100% - Refer Section 5.7	115%

9. Results of analysis

The results of the Net Present Value (NPV) cost-benefit analysis for each of the credible options considered in this RIT-D assessment, for each scenario are detailed below.

9.1 Gross market benefits

The gross market benefit is the sum of each of the individual categories of material market benefit, as quantified as set out in Section 8.2, expressed in present value terms over the 20-year analysis period.

Table 29 through to Table 32 summarises the present value of gross market benefits of Options 1 to 4 inclusive.

Table 29: Gross market benefits option 1

Option 1 Scenario	Present value ('000, real 2024-25)		
	Avoided EUE risk	**Avoided safety risk**	**Gross market benefit**
Weighted	1,158,874	1,298	1,160,171
Central	1,166,896	1,298	1,168,194
Low	892,675	1,103	893,778
High	1,409,027	1,492	1,410,519

Table 30: Gross market benefits Option 2

Option 2 Scenario	Present value ('000, real 2024-25)		
	Avoided EUE risk	**Avoided safety risk**	**Gross market benefit**
Weighted	1,157,321	1,130	1,158,451
Central	1,165,332	1,130	1,166,463
Low	891,479	961	892,440
High	1,407,139	1,300	1,408,439

Table 31 Gross market benefits Option 3

Option 3 Scenario	Present value ('000, real 2024-25)		
	Avoided EUE risk	**Avoided safety risk**	**Gross market benefit**
Weighted	1,155,420	960	1,156,380
Central	1,163,418	960	1,164,379
Low	890,015	816	890,831
High	1,404,828	1,104	1,405,932

Table 32 Gross market benefits Option 4

Option 4 Scenario	Present value ('000, real 2024-25)		
	Avoided EUE risk	**Avoided safety risk**	**Gross market benefit**
Weighted	94,101	1,298	95,399
Central	94,752	1,298	96,050
Low	72,485	1,103	73,589
High	114,413	1,492	115,906

Figure 9 shows the breakdown of gross market benefits for Option 1, 2, 3 and 4 for each year up to 2041 under the central scenario, assuming an optimum timing completion date of each option.

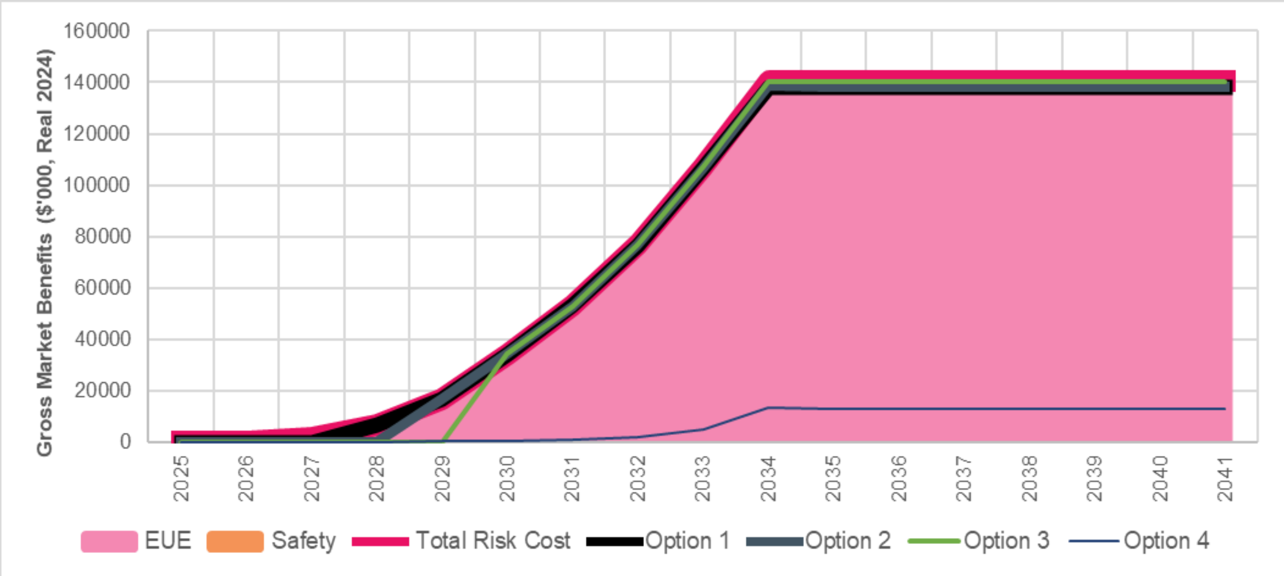

Figure 9: Gross market benefits: central scenario ($'000, real 2024-25)

9.2 Net Market Benefits

Table 33 summarises the net market benefit in present value terms for each credible option over a 20-year analysis period, relative to the base case (do nothing). The net market benefit is the present value of gross market benefits, under the weighted scenario (as set out in Table 29 through to Table 32), minus the present value of total investment costs of each option (as set out in Table 26). The table also shows the corresponding ranking of each option under the RIT-D, with options ranked in the order of descending net market benefit.

Table 33: Net market benefits of credible options for the weighted scenario

Options	Present value ('000, real 2024-25)			
	Investment cost	**Gross market benefits**	**Net market benefits**	**Ranking under RIT-D**
Do nothing	0	0	0	5
Option 1	67,204	1,160,171	1,092,967	1
Option 2	73,682	1,158,451	1,084,769	2
Option 3	95,587	1,156,380	1,060,793	3
Option 4	35,443	95,399	59,956	4

This RIT-D assessment demonstrates that Option 1 has the highest net market benefit under the weighted scenario.

9.3 Sensitivity assessment

CitiPower has tested the robustness of the RIT-D assessment to the inclusion of a number of sensitivity tests around the input assumptions adopted. These sensitivities were presented in Table 28. Table 34 shows the results of these sensitivity studies.

Table 34: Present net market benefits of credible options - sensitivities ($M, real 2024-25)

Sensitivity for Central Scenario	Option 1	Option 2	Option 3	Option 4
All Variables: base value	**1,101**	1,093	1,069	60.6
Maximum demand: lower bound	**984**	976	952	51.1
Maximum demand: upper bound	**1,159**	1,151	1,127	65.3
Capital and operational costs: lower bound	**1,114**	1,107	1,088	67.7
Capital and operational costs: upper bound	**1,088**	1,078	1,050	53.5
Value of customer reliability: lower bound	**868**	860	836	41.7
Value of customer reliability: upper bound	**1,334**	1,326	1,301	79.6
Discount rate: lower bound	**1,480**	1,471	1,446	93.3
Discount rate: upper bound	**829**	822	799	37.6
Asset failure rates: lower bound	**926**	918	894	46.2
Asset failure rates: upper bound	**1,276**	1,268	1,243	75.0

Option 1 has a present value of net market benefit that remains positive under all credible sensitivities, and when compared with Options 2, 3 and 4, clearly maintains its status as the preferred option under all credible sensitivities.

Table 35 presents the net market benefits in NPV terms for each option across all reasonable scenarios considered.

Table 35: Present value of net market benefits of credible options - scenarios ($M, real 2024-25)

Scenario	Do Nothing		Option 1		Option 2		Option 3		Option 4	
	NPV	Ranking	NPV	Ranking	NPV	Ranking	NPV	Ranking	NPV	Ranking
Weighted	0	5	1,093	1	1,085	2	1,061	3	60.0	4
Central	0	5	1,101	1	1,093	2	1,069	3	60.6	4
Low	0	5	827	1	819	2	795	3	38.1	4
High	0	5	1,343	1	1,335	2	1,310	3	80.5	4

For all reasonable scenarios considered, Option 1 maximises the present value of net market benefits for all scenarios, including under the weighted scenario (i.e. a weighting of the central, low and high scenarios).

Under the RIT-D, the preferred option should maximise the present value of the net market benefits to all those who produce, consume and transport electricity in the NEM when compared to other credible options and the base case. This RIT-D assessment, based on the sensitivity results in Table 34 and the scenario results in Table 35, demonstrates that Option 1 maximises the present value of net market benefits under all reasonable sensitivities and scenarios considered.

The preferred option for investment for the Brunswick and Fitzroy supply area is therefore Option 1 which is to Offload F to CW and offload BK to WB at 11 kV. This option satisfies the requirements of the RIT-D.

9.4 Economic timing

The previous Sections 9.2 and 9.3 demonstrate Option 1 - Offload F to CW and offload BK to WB at 11 kV, to be the preferred option to address the identified need. Although the choice of the preferred option is clear, the optimum timing of this investment is not, given a number of reasonable scenarios are investigated. The economic timing of the preferred option is when the annualised value of EUE and safety risk cost (i.e. the annualised cost of the total risk) exceeds the annualised cost of the preferred option. Table 36 shows the expected timing of the preferred option under each reasonable scenario.

Table 36: Expected timing of the preferred option

Scenario	Annualised cost of total risk minus investment costs ('000, real 2024-25)				Optimum timing before summer
	2026	**2027**	**2028**	**2029**	
Weighted	-2,252	-795	3,992	14,163	2027-28
Central	-2,251	-784	4,036	14,277	2027-28
Low	-2,306	-1,183	2,505	10,341	2027-28
High	-2,199	-428	5,391	17,757	2027-28

Under the weighted scenario the optimum timing of Option 1 is prior to summer 2027-28 (i.e. November 2027).

10. Preferred option

Section 9 has presented the results of the NPV analysis conducted for this RIT-D assessment. This RIT-D assessment has demonstrated that Option 1 maximises the present value of net market benefits under all reasonable sensitivities and scenarios considered.

The preferred option for investment is therefore Option 1. This option involves offloading F to CW and offloading BK to WB at 11 kV to allow decommissioning of F and BK.

This option addresses both the safety need and reliability need and maximises the present value of the net economic benefit to all those who produce, consume and transport electricity in the NEM, considering a set of reasonable state-of-the-world scenarios and their weightings.

The preferred option was tested under a range of sensitivities. In each case, Option 1 was confirmed to provide positive economic benefits in all sensitivities and is the highest-ranked option in all sensitivities.

The optimum timing for commissioning of the preferred option is no later than November 2027.

The preferred option has a capital cost of $57.5M (real, 2024-25).

The 20-year present value of net market benefits associated with the preferred option is $1,093M (real, 2024-25).

11. Next steps

This FPAR represents the final stage of the RIT-D process.

In accordance with the provisions set out in clause 5.17.5, paragraph (c) of the NER, Registered Participants or interested parties may, within 30 days after the publication of this report, dispute the conclusions made by CitiPower in this report with the Australian Energy Regulator (AER).

Any parties raising such a dispute are also required to notify CitiPower at ritdenquiries@citipower.com.au.

If no formal dispute is raised, CitiPower will commence with the investment activities necessary to proceed with the implementation of the preferred option.

For the purposes of referencing this RIT-D, this RIT-D is referred to as the "***Brunswick and Fitzroy Supply Area Asset Condition and Capacity Constraint***" identified need.

12. Checklist of compliance with NER clauses

This Section 12 sets out a compliance checklist which demonstrates the compliance of this DPAR with the requirements of clause 5.17.4, paragraph (j) and (r) of the NER in Table 37.

Table 37: NER requirements checklist

NER clause	Summary of requirements	Relevant section DPAR
5.17.4(j)(1)	A description of the identified need for investment	Section 4
5.17.4(j)(2)	The assumptions used in identifying the need (including, in the case of proposed reliability corrective action, why the RIT-D proponent considers reliability corrective action is necessary)	Section 5
5.17.4(r)(1)(ii)	Summary of, and commentary on, the submissions on the draft project assessment report;	Section 6
5.17.4(j)(4)	A description of each credible option assessed	Section 7
5.17.4(j)(5)	Where a Distribution Network Service Provider has quantified market benefits in accordance with clause 5.17.1(d), a quantification of each applicable market benefit for each credible option	Section 9.1
5.17.4(j)(6)	A quantification of each applicable cost for each credible option, including breakdown of operating and capital expenditure	Section 8.4
5.17.4(j)(7)	A detailed description of methodologies used in quantifying each class of cost and market benefit	Section 8.2
5.17.4(j)(8)	Where relevant, the reasons why CitiPower has determined that a class or classes of market benefits do not apply to a credible option	Section 8.3
5.17.4(j)(9)	The results of a net present value analysis for each option and accompanying explanatory statements regarding the results	Section 9.2 Section 9.3
5.17.4(j)(10)	The identification of the preferred option	Section 10
5.17.4(j)(11)	Details of the preferred option including technical characteristics, construction timetable and commissioning date, the indicative capital and operating cost (where relevant), a statement and accompanying detailed analysis that the preferred option satisfies the RIT-D, if the preferred option is for reliability corrective action and that option has a proponent and the name of the proponent.	Section 10

Appendix A: LQ, JA and SB supply areas

Figure 10 illustrates the extent of the Brunswick and Fitzroy supply area comprising of BK (orange) and F (green) zone substation supply areas, relative to the WB (blue) and CW (purple) supply areas.

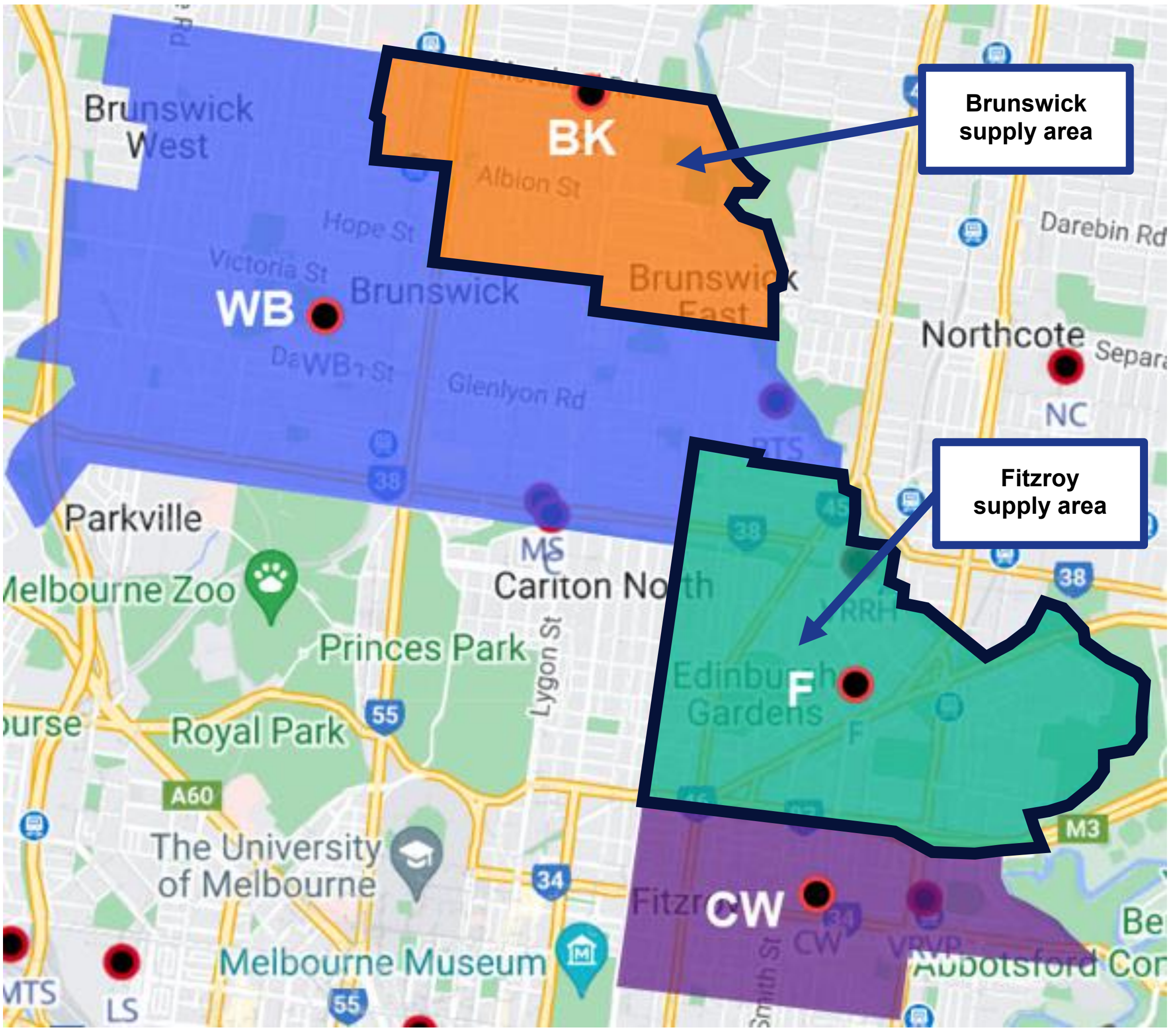

Figure 10: BK, F, WB and CW supply areas (existing)

Figure 11 illustrates the extension of the WB (blue) and CW (purple) supply areas into the Brunswick and Fitzroy supply area once BK and F are decommissioned.

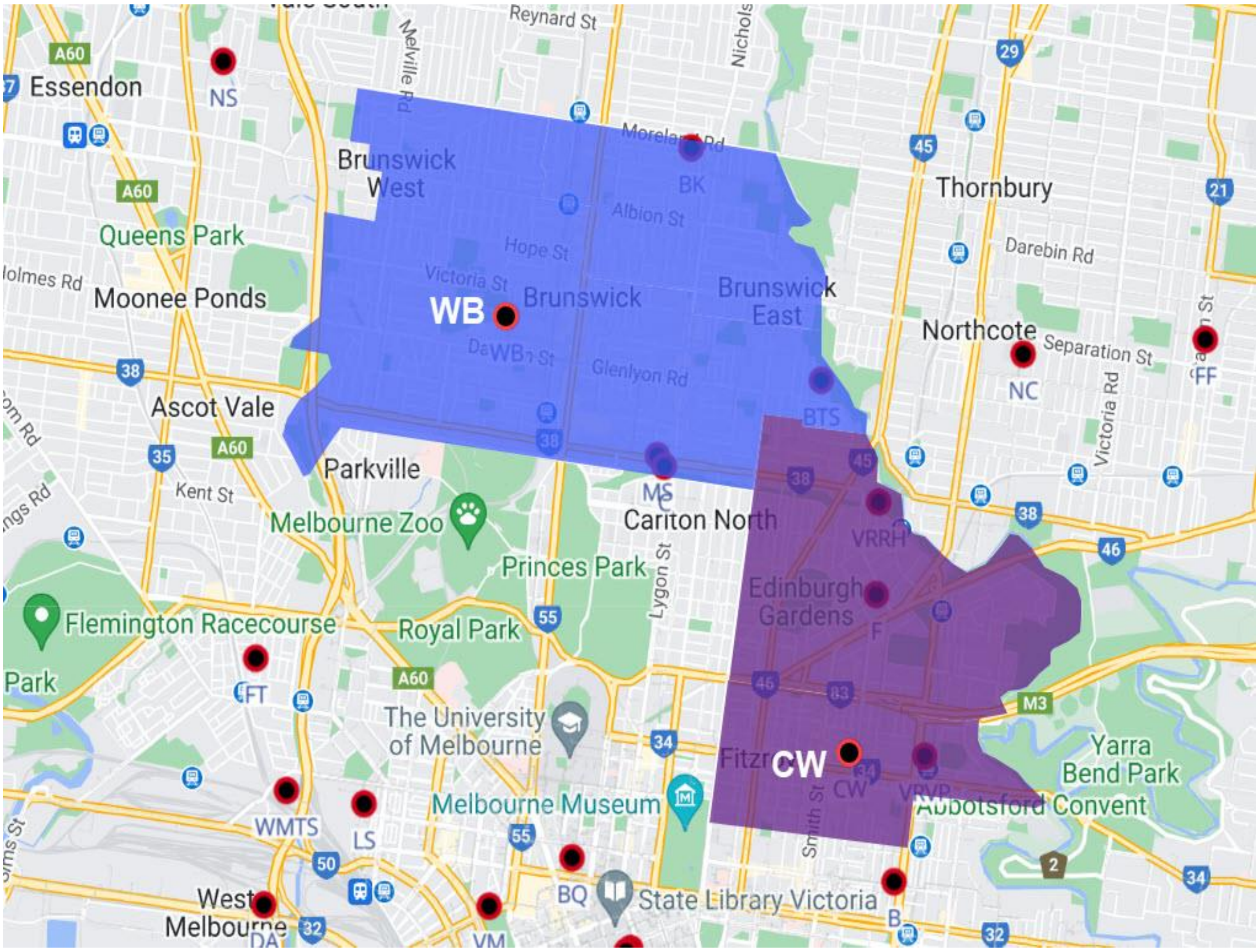

Figure 11: WB and CW supply areas (after network option 1)