RIT-D: Brunswick and Fitzroy Supply Area – Notice of Determination 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 more than 58,207 poles and over 7,525 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, 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 load growth and network contingencies.

CitiPower has identified potential credible network options to address the 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.

Based on this report, CitiPower has concluded on reasonable grounds, that none of the potential non-network or SAPS options investigated represent technically or commercially feasible alternatives, nor could any combination of non-network or SAPS options adequately address the identified need. Therefore, CitiPower has determined that the publication of, and the consultation on an options screening report, is not required in this instance.

1.2 Purpose

This Notice of Determination report has been prepared by CitiPower in accordance with the requirements of clause 5.17.4, paragraphs (c) and (d) of the National Electricity Rules (NER) version 217. CitiPower is normally required to publish an options screening report and request stakeholder submissions, as detailed in NER clause 5.17.4(e). However, in the event that there are no potential credible non-network or SAPS options (or any combination of those options with or without a network option) that could address the identified need, CitiPower is instead required to publish a Notice of Determination.

1.3 The Identified Need

The identified need for this RIT-D is triggered by aging 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 aging 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 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 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.

1.4 Next Steps

CitiPower is not required to publish and consult on an options screening report in this instance, because it has been determined on reasonable grounds, that there will not be a potential credible non-network or SAPS option that is able to address the identified need, nor any that forms a significant part of a potential credible option.

The total cost of the most expensive credible network option to address the identified need, is greater than the trigger threshold of $12 million[1] for the publication of and consultation on a Draft Project Assessment Report (DPAR). On this basis, CitiPower shall now prepare and publish a Draft Project Assessment Report (DPAR), as required under NER clause 5.17.4, paragraphs (i) to (m). CitiPower intends to publish the DPAR on 30 January 2025.

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

[1] https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/cost-thresholds-review-for-the-regulatory-investment-tests-2021

2. Introduction

This Notice of Determination report has been prepared by CitiPower in accordance with the requirements of clause 5.17.4, paragraphs (c) and (d) of the National Electricity Rules (NER) version 217, for the *Brunswick and Fitzroy Supply Area Capacity and Asset Condition Constraint* identified need.

CitiPower is not required to publish and consult on an options screening report in this instance, because it has been determined (on reasonable grounds) that there will not be a potential credible non-network or SAPS option that is able to address the identified need, nor any that forms a significant part of a potential credible option.

This report sets out the reasons for this determination, including the methods and assumptions used in making the determination.

The need for investment and the possible options for addressing the *Brunswick and Fitzroy Supply Area Capacity and Asset Condition Constraint* identified need, have been foreshadowed in CitiPower's 2023 Distribution Annual Planning Report (DAPR)[2].

This Notice of Determination report:

- Provides background information on the network limitations within the Brunswick and Fitzroy supply area.
- Identifies the need which CitiPower is seeking to address, together with the assumptions used in identifying that need.
- Describes the credible options that CitiPower currently considers may address the identified need, including for each:
  - Technical definitions;
  - The risk costs associated with the option for addressing the identified need;
  - The estimated commissioning date; and the total indicative cost (including capital and operating costs), with high-level cost breakdown.
- Sets out the technical characteristics that a non-network or stand-alone power system (SAPS) option would be required to deliver in order to address the identified need.

[2] CitiPower: Distribution Annual Planning Report. Available at: https://dapr.powercor.com.au/powercor_data/DAPR_2023_Citipower_Distribution%20Annual%20Planning%20Report.pdf

3. Definitions

Table 1: 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
EUE	Expected Unserved Energy (MWh pa)
F	Fitzroy Zone Substation
J	Spencer St Zone Substation
MD	Maximum Demand
MWp	Megawatt peak
NEM	National Electricity Market
NER	National Electricity Rules
POE	Probability of Exceedance
R	Richmond Zone Substation
RIT-D	Regulatory Investment Test for Distribution
SAPS	Standalone Power System
VCR	Value of Customer Reliability ($/MWh)
WB	West Brunswick Substation

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 (status quo).

4. Identified Need

4.1 Network Overview

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 which 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.

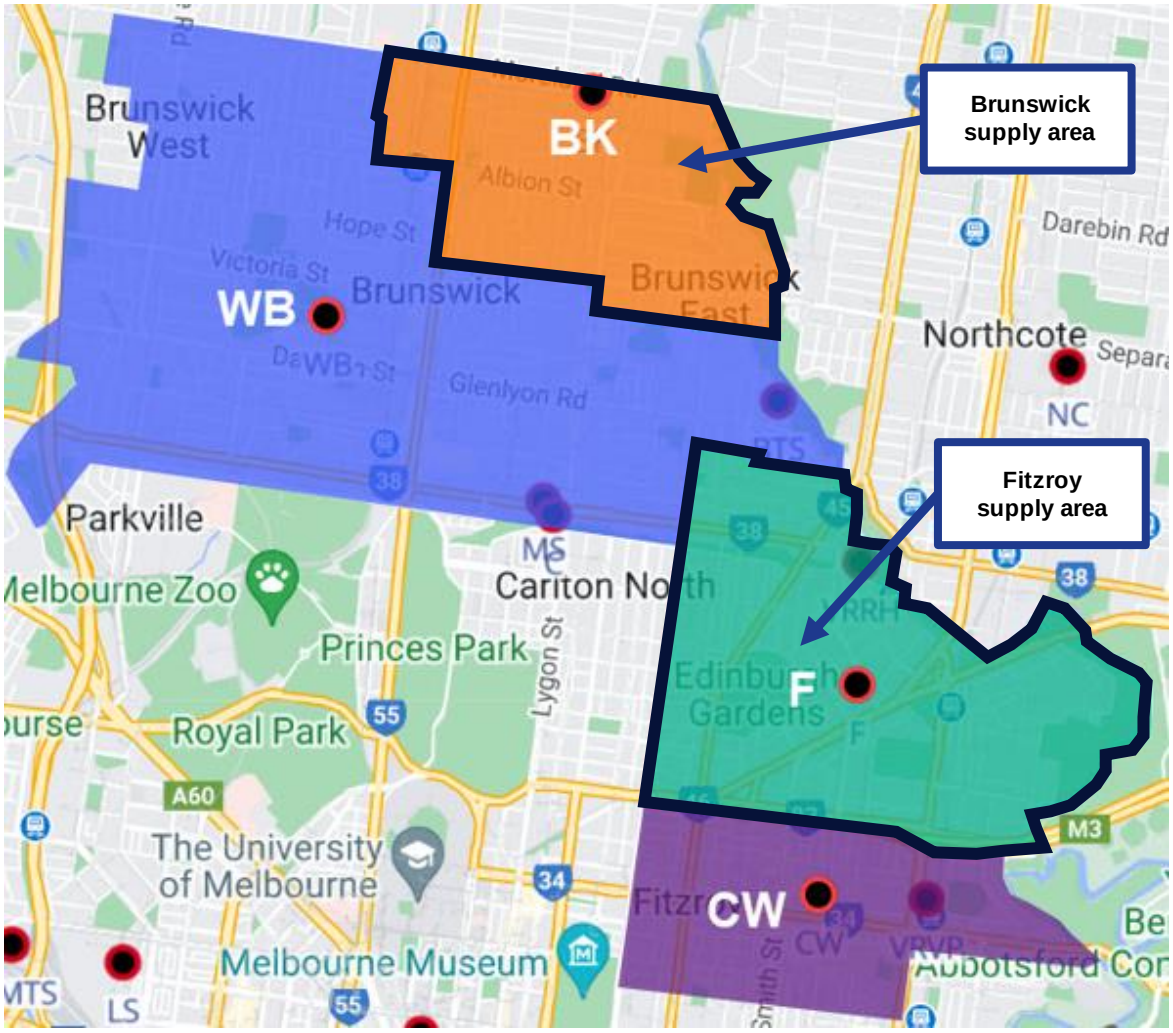

Figure 1: Brunswick and Fitzroy Supply Area

BK and F are owned and operated by CitiPower, providing power to approximately 8,041 and 8,579 customers respectively, with the majority of the load at BK and F comprising of mostly high-density residential and commercial customers.

BK is supplied by three 22 kV overhead lines from Brunswick Terminal Station (BTS). BK has three radially-connected 22/6.6 kV transformers 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 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 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 for the Brunswick and Fitzroy supply area, is illustrated in Figure 2.

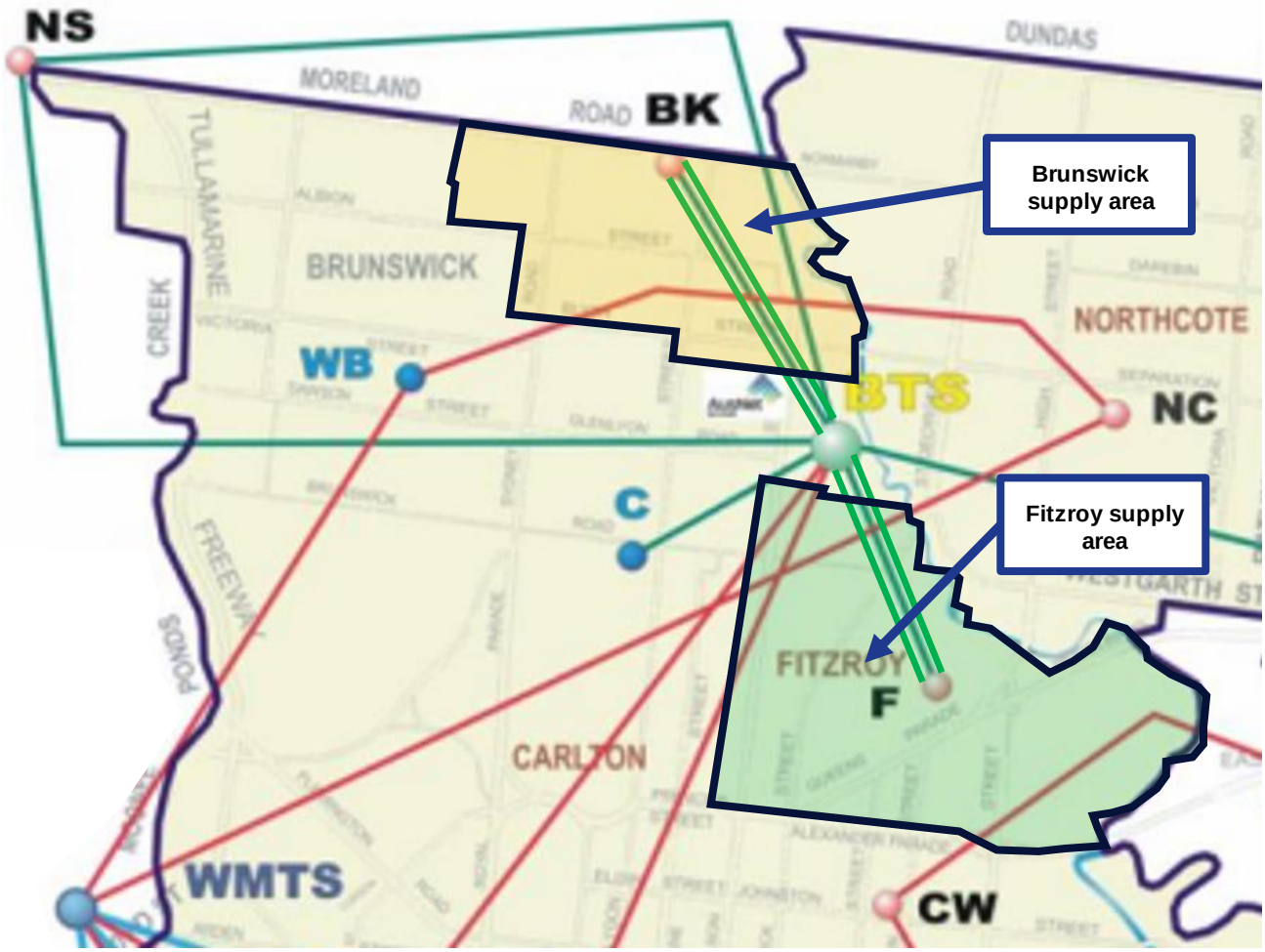

Figure 2: Brunswick and Fitzroy Supply Area Sub-transmission Single Line Diagram

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 prepared this report to assess whether the reliability and safety needs of BK and F could be realised either fully, or in part through non-network or SAPS options. To assess whether a non-network or SAPS option could be beneficial, it is important firstly to define the identified need for this location.

4.2.1 Asset Condition

Two of the three 22/6.6 kV transformers at BK are aging and are identical units to those at F zone substation, having the potential for a similar thermal defects to emerge. The units are over 70 years old and in an unsatisfactory visual condition, with minor oil leaks. Site oil containment is however satisfactory, having concrete bunds and a stormwater oil/water system.

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 is unsatisfactory and 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.

The majority 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 2 presents the ratings, and Table 3 the forecast maximum demand (MD) and capacity limitations for sub-transmission supply to BK. Values in red violate the N-1 rating, and values in **bold red** violate the N rating.

Table 2: BK Sub-transmission Ratings

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

Table 3: BK Sub-transmission Forecast Maximum Demand and Capacity Limitations

Year	Summer		Winter	
MVA	**50POE MD**	**10POE MD**	**50POE MD**	**10POE 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 4 presents the ratings, and Table 5 the forecast maximum demand (MD) and capacity limitations for sub-transmission supply to F. Values in red violate the N-1 rating, and values in **bold red** violate the N rating.

Table 4: F Sub-transmission Ratings

Summer	Winter

N-1	N	N-1	N
12.0	21.6	12.6	27.4

Table 5: F Sub-transmission Forecast Maximum Demand and Capacity Limitations

Year	Summer		Winter	
MVA	50POE MD	10POE MD	50POE MD	10POE 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 2030-31.

4.2.3 Zone substation Capacity Limitations

Table 6 presents the ratings, and Table 7 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** violate the N rating.

Table 6: BK Zone Substation Ratings

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

Table 7: BK Zone Substation Forecast Maximum Demand and Capacity Limitations

Year	Summer		Winter	
MVA	**50POE MD**	**10POE MD**	**50POE MD**	**10POE 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 normal and N-1 contingency conditions during the 10-year planning horizon starting from 2032 for a 10POE winter maximum demand and the following year for a 50POE winter maximum demand, and from 2033-34 for a 10POE summer maximum demand.

Table 8 presents the ratings, and Table 9 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** violate the N rating.

Table 8: F Zone Substation Ratings

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

Table 9: F Zone Substation Forecast Maximum Demand and Capacity Limitations

Year	Summer		Winter	
MVA	**50POE MD**	**10POE MD**	**50POE MD**	**10POE 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 aging 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 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 aging 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 of the Identified Need

Table 10 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 condition and capacity overload related) risk costs, being the potential market benefits considered for this RIT-D.

Table 10 Summary of Risk Costs ($'000, Real 2024)

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.

No 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.

5. Key Assumptions in Relation to the Identified Need

5.1 Method for 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 takes into account 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 Value of Customer Reliability (VCR) ($/MWh).

5.2 Forecast Maximum Demand

A credible network, non-network or SAPS solution should consider the maximum demand requirements of customers within the Brunswick and Fitzroy supply area and the load at risk capacity limitations forecast for that area. Our forecasts of maximum demand and capacity limitations for summer and winter for 10POE and 50POE weather conditions are presented in section4.2, for BK and F zone substations, and their associated sub-transmission supplies.

5.3 Forecast Annual Energy

A credible network, non-network or SAPS solution should consider the net annual energy requirements of customers within the Brunswick and Fitzroy supply area as shown in Table 11 and the value of expected unserved energy (EUE) presented in section 4.3.

Table 11: Brunswick and Fitzroy Supply Area Annual Energy (GWh pa)

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

A credible network, non-network or SAPS solution should be able to support the load profiles below.

CitiPower has prepared load profiles that are characterised by the use of profiles from the most recent 50POE 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 at BK and F expressed as a percentage of the 50POE maximum demand listed in section 4.2, is illustrated in Figure 3 and Figure 4 respectively.

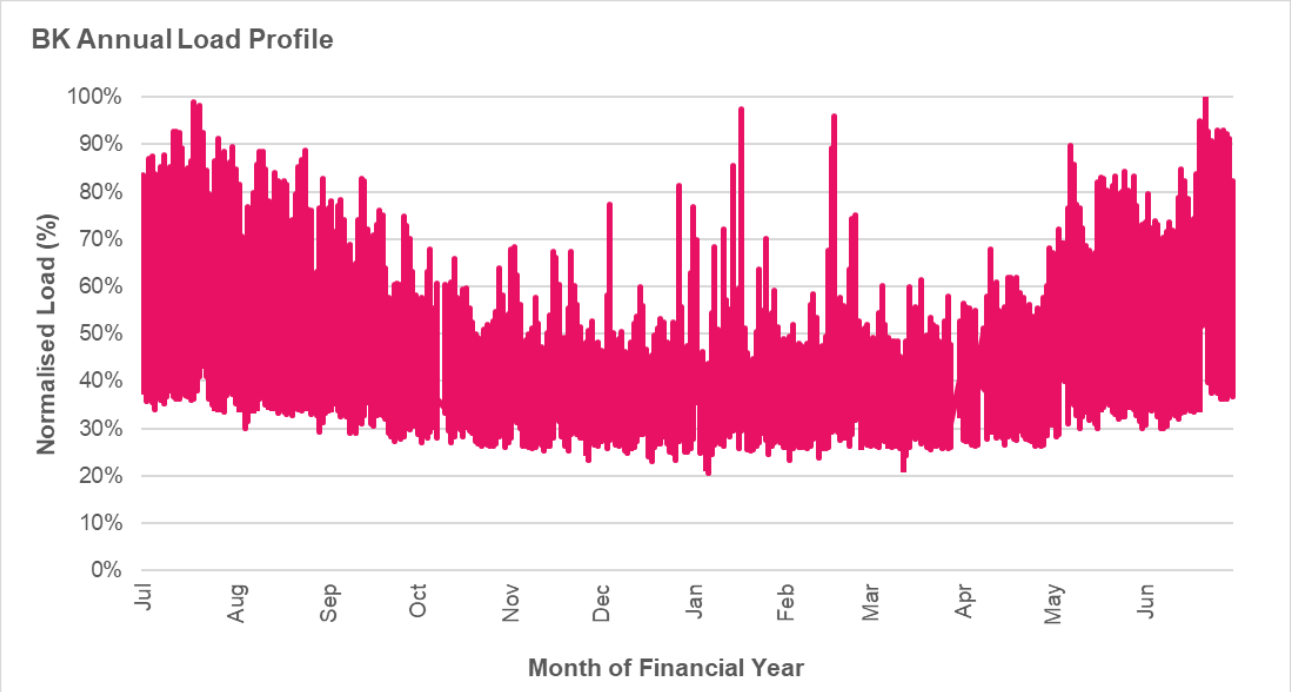

Figure 3: Annual Load Profile at BK

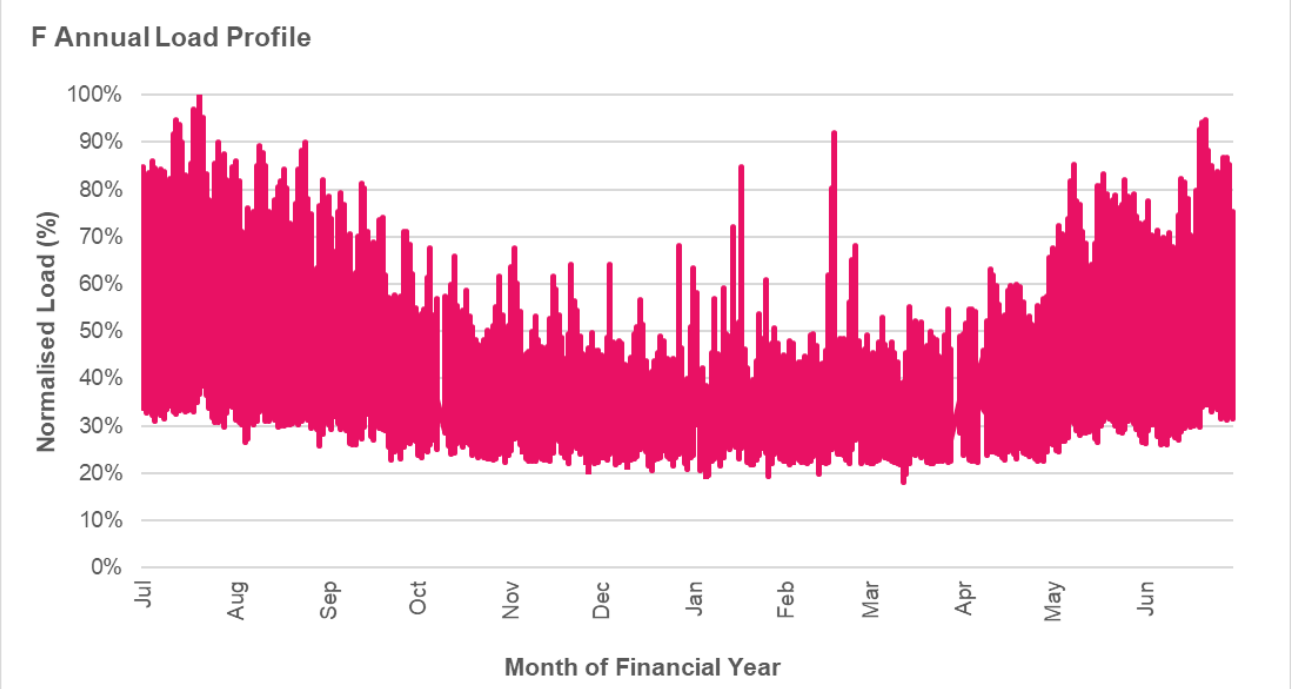

Figure 4: Annual Load Profile at F

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

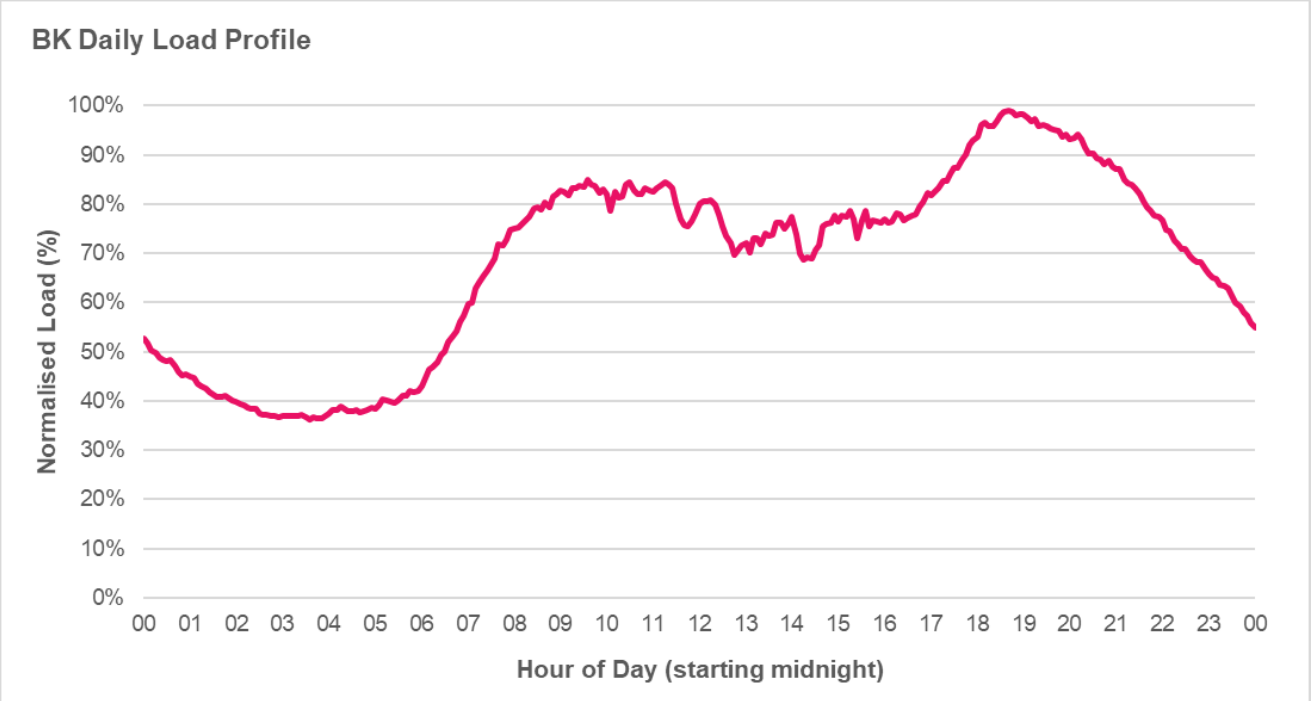

Figure 5: Load Profile on Day of Summer Maximum Demand at BK

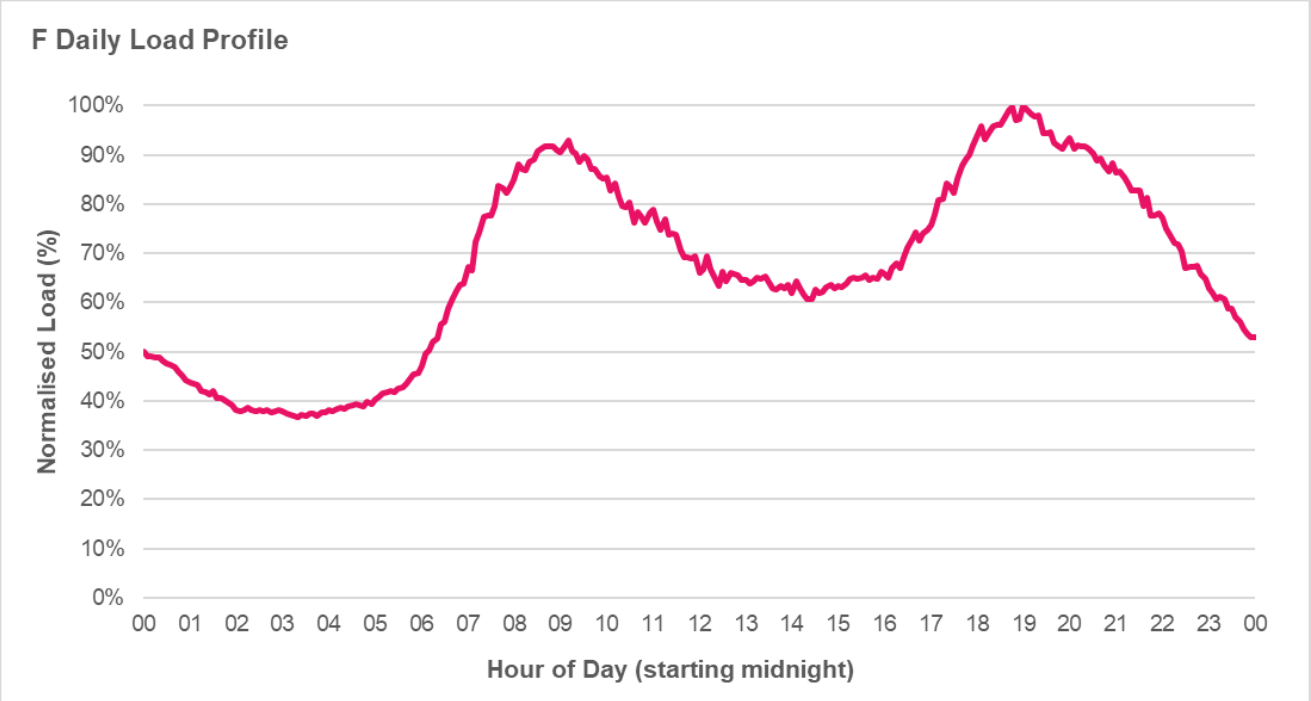

Figure 6: Load Profile on Day of Summer Maximum Demand at F

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

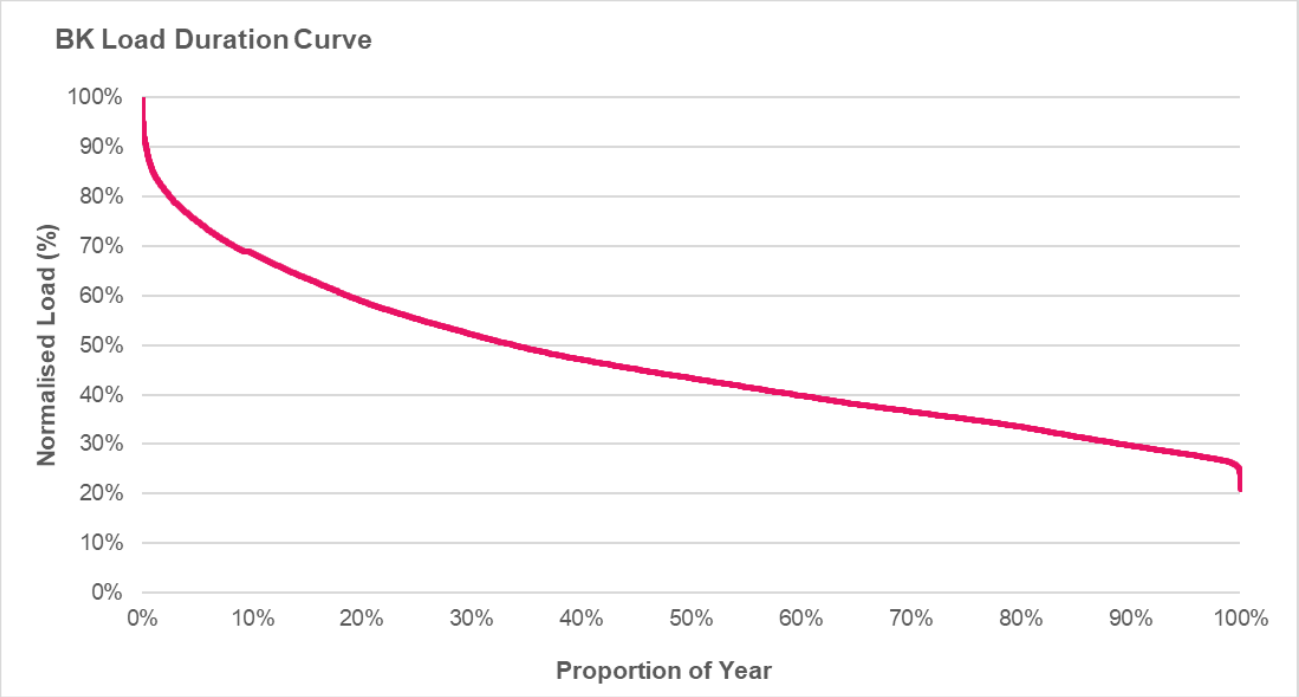

Figure 7: Annual Load-Duration Curve at BK

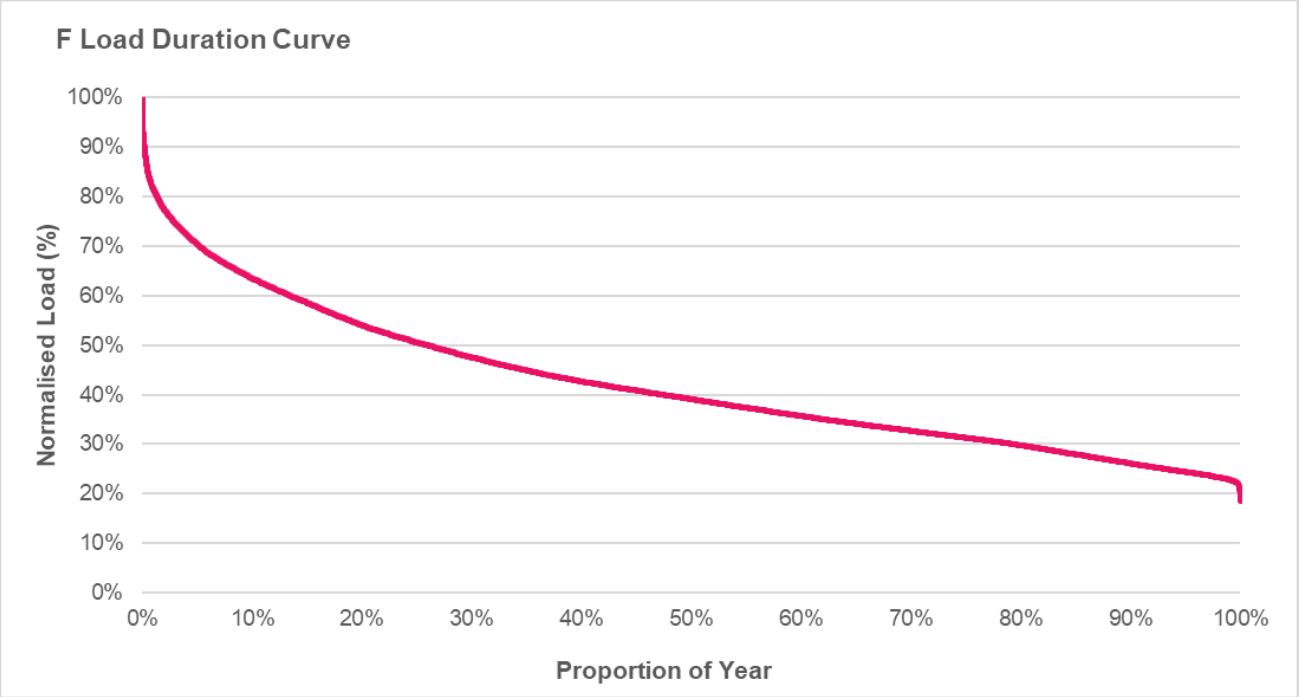

Figure 8: Annual Load-Duration Curve at F

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

A credible network, non-network or SAPS solution can assume load transfer capability (to WB) as listed in Table 12.

Table 12: 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

A credible network, non-network or SAPS solution should provide for supply to be restored within 60 minutes (on average) following the loss of a plant item causing an outage

5.6 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.

5.7 Asset Ratings

A credible network, non-network or SAPS solution should consider the capability (ratings) of existing network assets within Brunswick and Fitzroy supply area and the spare capacity forecast for that area. Refer to sections 4.1 and 4.2 for details on asset ratings and spare capacity.

5.8 Value of Customer Reliability

Location-specific Value of Customer Reliability (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 13.

Table 13: Summary of Location Specific VCR

Zone Substation	VCR ($ per MWh, Real 2024)
BK	40,802
F	37,046

6. Potential Credible Options to Address the Identified Need

CitiPower has developed a set of potential credible options to address the network limitations relating to the *Brunswick and Fitzroy Supply Area Capacity and Asset Condition Constraint* identified need.

To address the safety need described in section 4.2, credible network, non-network or SAPS options would be required to have characteristics that would allow the safe decommissioning or rectification of the BK and F zone substation asset condition.

To address the reliability need described in section 4.2, credible options would need to be capable of supplying the demand and energy requirements of customers supplied by BK and F, taking into account the occurrence of the forecast capacity limitations, and the available load transfer capacity. The technical requirements of non-network and SAPS options to address the identified need are detailed in section 7.

Table 14 provides a summary of the base case option, using the risk costs presented earlier in Table 10.

Table 14: Base Case

Option	Description
Do Nothing (status quo)	This base case option involves continuing to operate the existing aging 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 20-year present value of all costs (safety and EUE risk) is $1,188 million (Real, 2024).

Table 15 provides a summary of credible options that could address the identified need.

Table 15: Credible Options Under Consideration

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 $57.5 million (Real, 2024). The present value of all costs (capital, O&M, safety and EUE risk) is $87.0 million (Real, 2024).
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 $64.5 million (Real, 2024). The present value of all costs (capital, O&M, safety and EUE risk) is $95.3 million (Real, 2024).
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 $77.7 million (Real, 2024). The present value of all costs (capital, O&M, safety and EUE risk) is $119.2 million (Real, 2024).

4. Asset replacement at BK and F (in-situ)	This option replaces the aging F and BK assets (in-situ), including the 6.6 kV switchboards and 22/6.6 kV transformers, retaining the existing distribution network voltage at 6.6 kV. The total capital cost of this option is $30.9 million (Real, 2024). The present value of all costs (capital, O&M, safety and EUE risk) is $1,127 million (Real, 2024).

A credible option needs to be technically and economically feasible, and able to be implemented within a reasonable timeframe to address the identified need. Table 16 describes the options that have been considered by CitiPower and are regarded as not being credible for the reasons set out below. These include all remaining network, non-network and SAPS options.

Table 16: Options Regarded as being Not Credible

Option	Description
Decommission BK and F and transfer all load to surrounding zone substations.	Decommissioning of BK and F alone is not feasible as there are no ability to transfer load to the adjacent zone substations WB and CW because they operate at different voltage levels. BK and F operate as essentially islanded 6.6 kV systems surrounded by a network of 11 kV systems. Without a conversion of the BK and F 6.6 kV distribution networks to 11 kV, this option is not regarded as credible.
Power factor correction	The power factor at BK and F is currently 0.99 and unity respectively at times of maximum demand, and there is no opportunity to reduce demand at the network or customer level as seen by BK and F using power factor correction. This option is not credible, because it cannot technically address the identified need in relation to reliability or safety risks.
Demand response programmes	Demand response programs are generally designed for peak demand management, whereas the asset condition safety need at BK and F requires a response year round. The ability of all customers to be self-sufficient in their electricity demand at all times and for all year round to meet the identified need, is considered to be unfeasible, as it effectively requires all customers within the BK and F supply area to disconnect from the network. Hence this option is not credible.
Customer and/or community renewable generation and energy storage	Referring to Table 17 and Table 18, distributed generation of up to 65 MW[3] using solar PV is likely to require more than 65 hectares of land[4] Devoting this amount of land to energy production in a dense, urban environment is unlikely to be feasible. Nevertheless, solar PV installations installed on rooftops of buildings within the BK and F supply area, could provide the amount of generation required at a competitive cost. The challenge however lies in the provision of storage to back-up the solar PV panels when they are not operating. A viable storage option that meets the maximum demand at BK and F, reliably meeting customer requirements, requires 'N' batteries (where 'N' ≥ 2) each able to supply (65 ÷ N) MWp, each with an energy to power ratio of around 10[5]. This would enable the system to meet maximum demand and coupled with solar PV, supply the annual energy needs. The costs of the storage alone is likely to exceed those of the preferred network option. For example, the fully installed capex cost of storage is approximately $0.5 million per MWh[6], totalling $325 million[7] (excluding land). This option would lead to a much higher marginal cost to the customer compared to a network solution cost, and the gap would need to be covered from other market-based

[3] 30.8 MW at BK + 33.6 MW at F = 65 MW

[4] https://www.quora.com/How-much-land-is-required-to-setup-a-1MW-solar-power-generation-Unit-1

[5] (122,700 MWh pa at BK + 118,800 MWh pa at F) / 365 days pa / 65 MW = 10.

[6] https://www.csiro.au/en/news/all/news/2024/may/csiro-releases-2023-24-gencost-report

[7] 65 x 10 x 0.5 = $325 million.

Option	Description
	revenues. The planning process required for this type of investment, means this is unlikely to be completed in time to meet the identified need. The storage resources owned by individual customers indicates that no potential existing customer-owned storage would be large enough to meet the identified need. Therefore, this option is not considered to be credible.
Dispatchable generation and/or Customer standby generation	Referring to Table 17 and Table 18, a viable generation option that meets the maximum demand at BK and F and reliably meets customer requirements requires at least two generators to allow maintenance on one generator during off-peak times, each able to supply up to (65 ÷ N) MWp, where 'N' is the number of generators. This would enable the system to meet maximum demand and supply the annual energy needs. The costs of this are likely to exceed those of the preferred network option. For example, the capex cost of small gas-fired generator is approximately $1.25 million per MW[8]. For 65 MW of generation, the cost will be over $83 million[9], excluding land, connection and operating costs. This option would lead to a much higher marginal cost to the customer compared to a network solution cost, and the gap is unlikely to be covered from other market-based revenues. The planning process required for this type of investment, also means this is unlikely to be completed in time to meet the identified need. The maximum demands of individual customers indicate that no potential existing customer-owned generation (standby or otherwise) would be large enough to meet the identified need. Therefore, this option is not considered to be credible.

[8] https://aemo.com.au/-/media/files/electricity/%E2%80%8Cnem/%E2%80%8Cplanning_and_%E2%80%8Cforecasting/%E2%80%8Cinputs-assumptions-methodologies/%E2%80%8C2021/Aurecon-Cost-and-Technical-Parameters-Review-2020.pdf

[9] 65 x 1.25 = $83 million.

7. Technical Characteristics of Non-Network Options

This section describes the minimum technical characteristics that a non-network or SAPS option would be required to deliver to address the identified need.

Like the network options, credible non-network and SAPS options would be required to have characteristics that would allow the safe decommissioning of BK and F and would need to be capable of supplying the net annual energy requirements of all customers supplied by BK and F, and the maximum demand at BK and F over the planning horizon, taking into account the available load transfer capacity .

A credible non-network or SAPS option, or any combination of those (including with a network option) must satisfy timing, operational and the minimum technical requirements stipulated below.

7.1 Size of Support

Table 17 and Table 18 outline the estimated amount of load reduction, or additional generation needed to be supplied by a credible non-network or SAPS solution within the Brunswick and Fitzroy supply area to address the identified need. These are the minimum requirements, because the values reflect the load transfer capability away from BK and F to their surrounding zone substation, WB.

Table 17: Brunswick (BK) Supply Area Non-Network or SAPS Solutions Requirements

Year	Duration (Hours pa)	Expected Energy (GWh pa)	Expected Capacity (MWp)
2025	8755	66.2	13.5
2026	8759	71.0	14.9
2027	8760	76.3	16.5
2028	8760	82.7	18.4
2029	8760	90.2	20.6
2030	8760	98.3	22.9
2031	8760	105.2	25.0
2032	8760	112.0	27.0
2033	8760	119.0	29.1
2034	8760	124.6	30.8

Table 18: Fitzroy (F) Supply Area Non-Network or SAPS Solutions Requirements

Year	Duration (Hours pa)	Expected Energy (GWh pa)	Expected Capacity (MWp)
2025	8223	64.3	14.2
2026	8749	68.8	15.8
2027	8760	74.2	17.7
2028	8760	80.3	19.7
2029	8760	87.1	22.0
2030	8760	94.4	24.5
2031	8760	101.2	26.8
2032	8760	108.1	29.2
2033	8760	115.0	31.5
2034	8760	120.7	33.6

7.2 Time of Year, Duration and Location of Support

Proposed non-network or SAPS options, at a minimum, must be capable of supplying the entirety of the BK and F supply area maximum demand and annual energy, taking into account available load transfer capacity. This service is required no later than by November 2027.

7.3 Reliability of Support

Proposed non-network and SAPS options must be capable of reliably meeting electricity demand under a range of conditions and be able to maintain reliability and quality of supply levels for customers supplied within the Brunswick and Fitzroy supply area. As such, redundancy may need to be built into a non-network or SAPS solution in order to maintain reliability of supply. If the non-network option is a generator operating in parallel with CitiPower's network, the generator must comply with the requirements set out in CitiPower's Embedded Generation Network Access Standards.

8. Conclusion and Next Steps

8.1 Conclusion

Given the size of the support needed from a non-network or SAPS solution, and it being required at all times of the year to maintain supply reliability within the Brunswick and Fitzroy supply area (following the safe decommissioning of BK and F), it is unlikely that a non-network or SAPS option could be technically and economically viable to address the identified need.

In conclusion, this Notice of Determination report demonstrates that none of the non-network or SAPS options are potentially feasible in this instance. The analysis demonstrates that there are no combinations of non-network or SAPS options, or in combination with network options, that are likely to adequately meet the criteria that would require the publishing of, and consultation on a RIT-D options screening report.

8.2 Next Steps

The total cost of the most expensive credible network option to address the *Brunswick and Fitzroy Supply Area Capacity and Asset Condition Constraint* identified need, is higher than the trigger threshold of $12 million [10] for the publication of and consultation on a Draft Project Assessment Report (DPAR).

Therefore, CitiPower shall now prepare and publish a Draft Project Assessment Report (DPAR), as required under NER clause 5.17.4, paragraphs (i) to (m), which will present a detailed economic assessment of all credible network options that address the identified need. It will also identify the preferred option and its optimum timing.

The DPAR shall provide information required under NER clause 5.17.4, paragraph (j), and will apply the latest available information on reliability and safety risk costs associated with the identified need, and the project cost estimates, in evaluating the economic viability of the preferred option against the alternative options considered.

CitiPower intends to publish the DPAR on 30 January 2025.

[10] https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/cost-thresholds-review-for-the-regulatory-investment-tests-2021

Appendix A: BK, F, WB and CW Supply Areas

Figure 9 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.

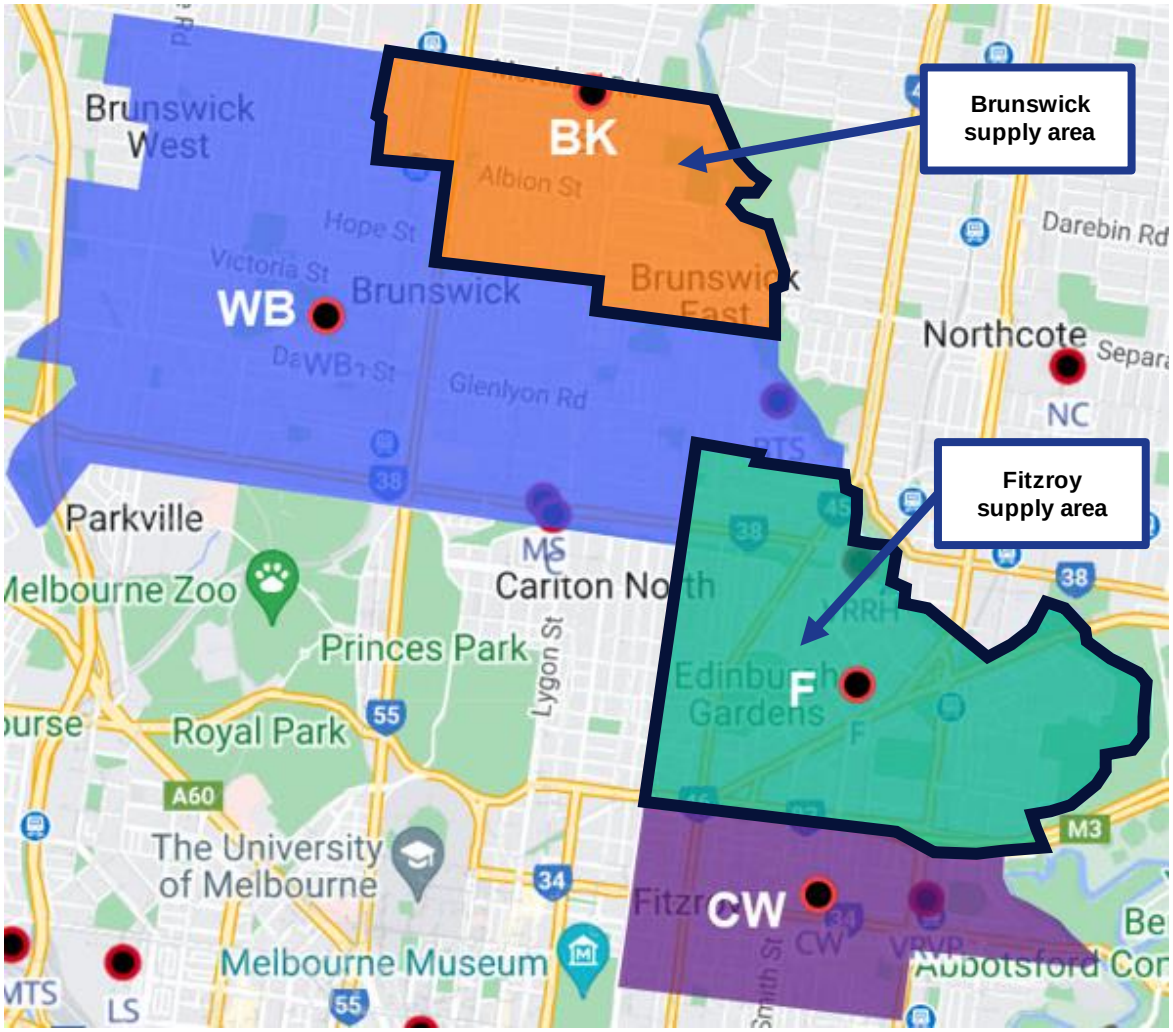

Figure 9: BK, F, WB and CW Supply Areas (Existing)

Figure 10 illustrates the extension of the WB (blue) and CW (purple) supply areas into the Brunswick and Fitzroy supply area once BK and Fare decommissioned.

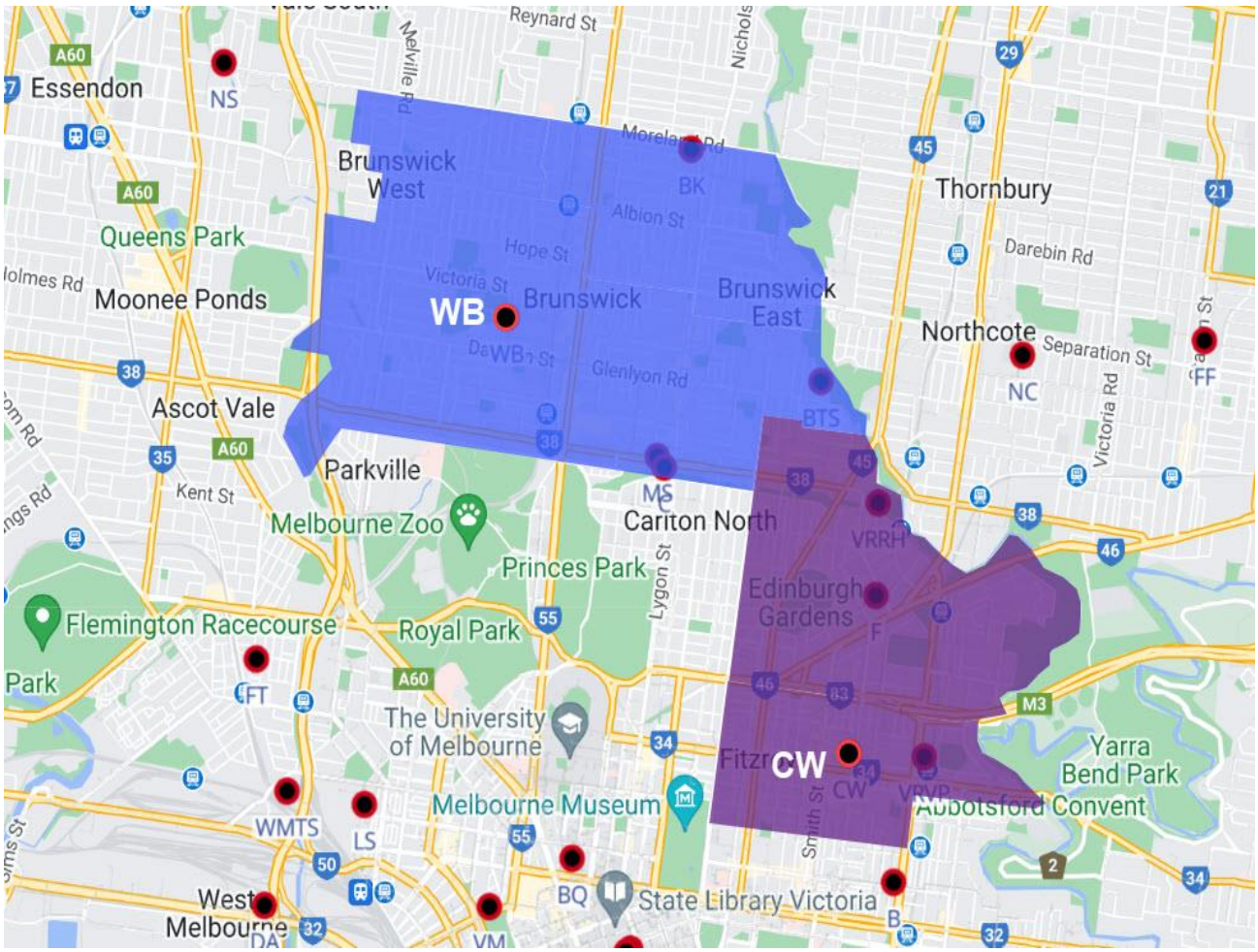

Figure 10: WB and CW Supply Areas (After Proposed Network Option 1)