RIT-D: Collingwood (CW) 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 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 Collingwood Zone Substation (CW) supply area (i.e. CW supply area).

CW is supplied by two 66 kV sub-transmission circuits originating from the Richmond terminal station (RTS) in a loop with Collingwood (B) and North Richmond (NR) zone substations. This zone substation supplies parts of Collingwood and Fitzroy, and comprises two 20/27 MVA transformers operating at 66/11 kV, connected to three 11 kV buses in an indoor metal clad switchboard with compound filled cable termination boxes.

CW was constructed in 1961 and most of the original substation equipment remains in service. This includes the existing Email Westinghouse J-series 11 kV switchboard and switchgear which was designed with no arc fault containment, presenting a safety risk to our operators and personnel accessing this site. The switchboard, switchgear and secondary systems at CW are deteriorating in condition, have no spare parts, and are at end of life.

CitiPower has identified potential credible network options to address the asset condition risks at CW 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 230. 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 CW 11 kV Email Westinghouse switchboard is non-arc fault contained and consists of four compound insulated bus sections containing J-series bulk oil circuit breakers. The switchboard and switchgear are 64 years of age.

The insulation of the CW 11 kV indoor metal clad switchboard has been deteriorating over the last several years. A number of minor partial discharge (PD) sources have been identified and rectified however these repairs are not a long-term solution as other PD sources detected from within the bus indicate that imminent replacement is warranted.

Due to the age of this equipment, new replacement parts are unavailable for this switchboard type. Furthermore, failure of this equipment would likely be catastrophic, resulting in explosion and fire.

The original secondary assets at CW including electromechanical protection relays are also experiencing condition deterioration, and are technically obsolete with limited spares, and no longer supported by vendors. This poses a serious safety and reliability risk for the ongoing fault protection coverage of CW and its distribution network. Furthermore, the poor condition of the protection devices that are supposed to be protecting this poor condition switchboard, could result in a catastrophic failure, if a simultaneous switchboard internal fault coincides with a protection relay failing to operate.

The asset management need at CW is to maintain a safe and reliable supply of electricity to customers in the CW supply area. This recognises the risks associated with the existing switchboard, including the increasing probability, severity, and consequence of failure—for example:

- deterioration in compound-filled assets is typically monitored by measuring partial discharge activity, with changes in partial discharge activity providing early warnings of impending failure; partial discharges have been detected within the switchboard;
- the compound-filled cable termination boxes and this switchboard are not designed to contain arc-faults, creating the potential for adverse safety outcomes associated with explosive failures;

- the configuration and loading of CW are such that a fault would be expected to negatively impact on CitiPower's ability to supply load to the CW supply area and surrounds;
- good asset management practice from the broader industry supports the view that compound-filled and non-arc fault contained equipment pose an increasing safety and reliability risk, and should be progressively removed from service.

The identified need at CW is to:

I. protect power sector workers and members of the public from harm caused by equipment failure (Safety); and

II. continue to maintain a reliable power supply to the residences and businesses that are dependent on the supply from this distribution network (Reliability).

Solutions to the identified need shall manage and mitigate the increasing risk of secondary asset and switchgear failure, to maintain safety and reliability of electricity supply to CitiPower's customers and workforce within the CW supply area. Solutions need to support CitiPower plans to reduce the population of non-arc fault contained switchboards that comprise oil filled circuit breakers and electromechanical protection and control relays.

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 $14 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 DPAR as required under NER clause 5.17.4, paragraphs (i) to (m). CitiPower intends to publish the DPAR by 27 June 2025.

For the purposes of referencing this RIT-D, this RIT-D is referred to as the "***Collingwood Zone Substation (CW) Secondary Assets and Switchgear Condition***" identified need.

[1] 2024 cost thresholds review for the regulatory investment test | Australian Energy Regulator (AER).

2. 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 more than 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.

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 230, for the Collingwood Zone Substation (CW) Secondary Assets and Switchgear Condition 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 Collingwood Zone Substation (CW) Secondary Assets and Switchgear Condition identified need, have been foreshadowed in CitiPower's 2024 Distribution Annual Planning Report (DAPR)[2].

This Notice of Determination report:

- Provides background information on the network limitations at Collingwood Zone Substation (CW), and for the CW supply area for which it services.
- 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 of the credible options;
    - The safety and reliability of supply 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://media.powercor.com.au/wp-content/uploads/2024/12/31085532/DAPR_2024_Citipower_Distribution-Annual-Planning-Report-1.zip.

3. Definitions

Table 1: Terms and Definitions

Term	Definition
A.C.	Alternating Current
AEMO	Australian Energy Market Operator
AFAP	As Far As Practicable
B	Collingwood B Zone Substation
CBD	Central Business District
CW	Collingwood Zone Substation
DAPR	Distribution Annual Planning Report
D.C.	Direct Current
DPAR	Draft Project Assessment Report
EUE	Expected Unserved Energy (MWh pa)
F	Fitzroy Zone Substation
MWp	Megawatt peak
NCC	Network Control Centre
NEM	National Electricity Market
NER	National Electricity Rules
NR	North Richmond Zone Substation
O&M	Operations and Maintenance
PD	Partial Discharge
PoE	Probability of Exceedance
RIT-D	Regulatory Investment Test for Distribution
RTS	Richmond Terminal Station
SAPS	Standalone Power System
VCR	Value of Customer Reliability ($/MWh)

Term	Definition
50% PoE	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.
10% PoE	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.

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 Collingwood Zone Substation (CW) supply area (i.e. CW supply area), which is located immediately north-east of Melbourne's CBD.

CW is owned and operated by CitiPower, providing power to approximately 9,739 customers, with the majority of the load at CW comprising of high density commercial and residential customers.

CW is supplied by two 66 kV sub-transmission circuits originating from the Richmond terminal station (RTS) in a loop with Collingwood (B) and North Richmond (NR) zone substations. This zone substation supplies parts of Collingwood and Fitzroy, and comprises two 20/27 MVA transformers operating at 66/11 kV, connected to three 11 kV buses in an indoor metal clad compound-filled switchboard with eleven 11 kV distribution feeders and two 11 kV capacitor banks.

The cyclic rating of CW with all transformers in service is 65.3 MVA in summer and 73.4 MVA in winter, and with one transformer out of service the ratings reduce to 34.4 MVA and 38.2 MVA respectively. This compares to a forecast 10 per cent probability of exceedance (PoE) maximum demand of 29.5 MVA for 2024/25, rising to 52.3 MVA by 2028/29. The switchboard configuration diagram for CW, is illustrated in Figure 1.

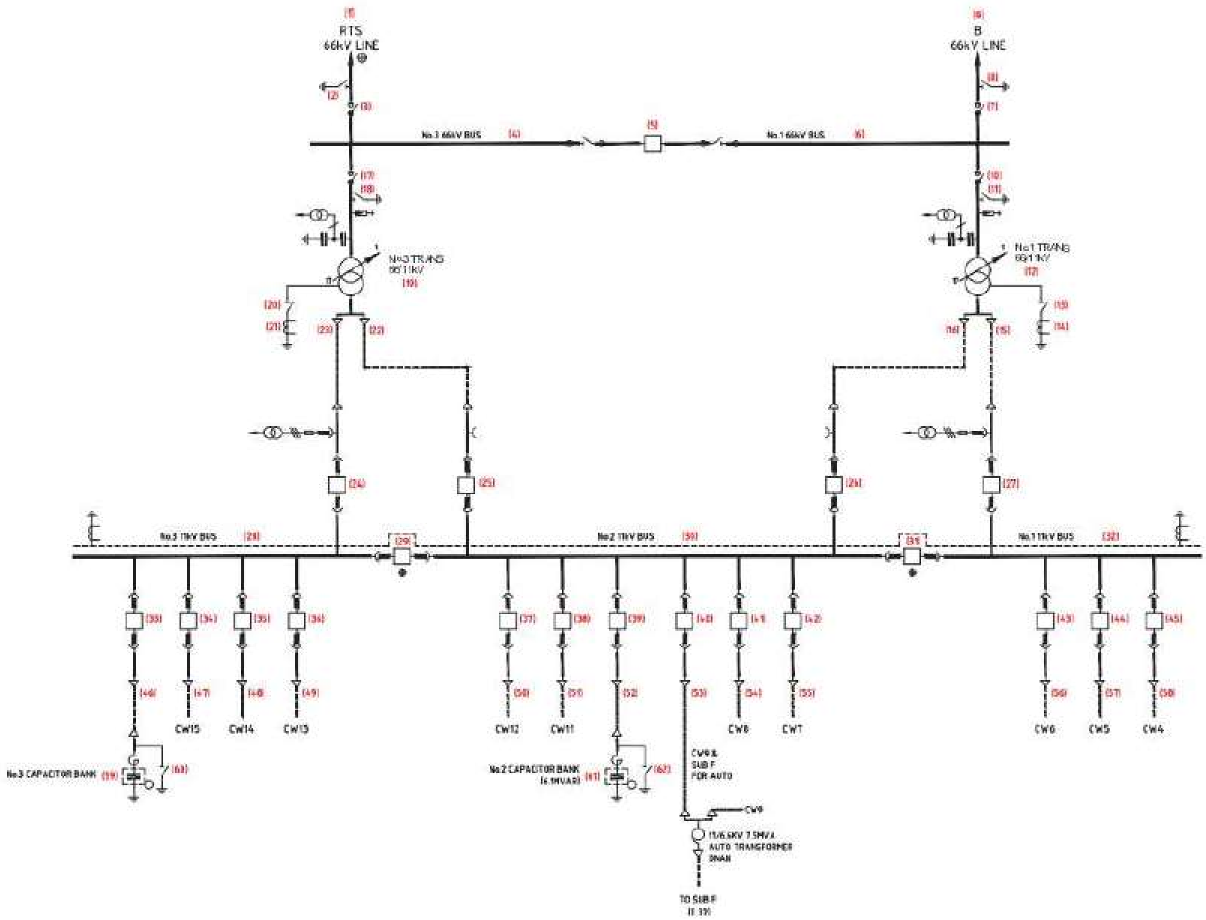

Figure 1: CW Electrical Single Line Diagram

The power supply coverage of CW is illustrated in Figure 2. The supply area is bounded approximately by Hoddle St/Yarra River in the east, Alexander Pde in the north, Gipps St/Webb St in the south, and Nicholson St in the west.

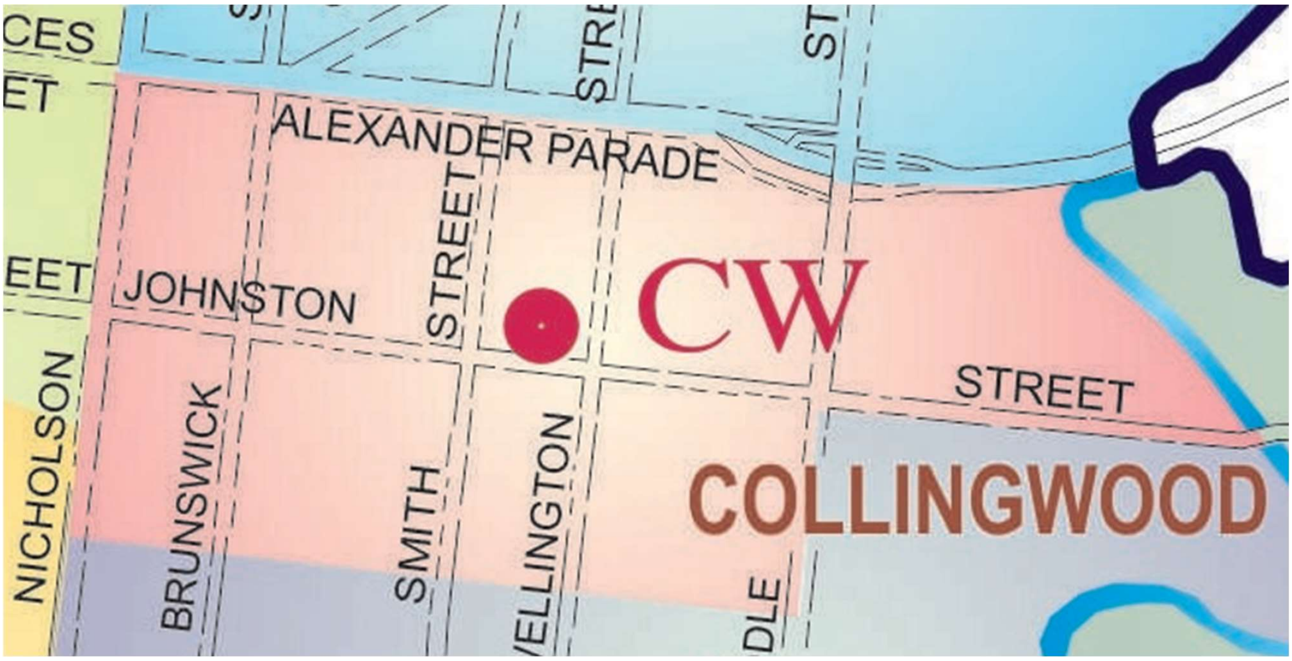

Figure 2: CW Supply Area

4.2 Description of the Identified Need

CitiPower has prepared this report to assess whether the reliability and safety needs of CW 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.

CW was constructed in 1961 and most of the original substation equipment remains in service. This includes the existing Email Westinghouse J-series switchboard and switchgear which was designed with no arc-fault containment, presenting a safety risk to our operators and personnel accessing this site. The switchboard and secondary systems at CW are deteriorating in condition, have no spare parts, and are at end of life.

The condition of the secondary assets[3] and switchgear[4] at CW, necessary for the provision of a safe and reliable power supply to customers within the CW supply area, are deteriorating, and technically obsolete, being unsupported by equipment suppliers with no spares.

The CW 11 kV Email Westinghouse switchboard is non-arc fault contained and consists of three air insulated bus sections containing J-series bulk oil circuit breakers with compound filled cable termination boxes. The switchboard and switchgear are 64 years of age.

The insulation of the CW 11 kV indoor metal clad switchboard has been deteriorating over the last several years. A number of minor partial discharge (PD) sources have been identified and rectified however these repairs are not a long-term solution as other PD sources detected from within the bus indicate that imminent replacement is warranted. These other PD sources are not possible or feasible to repair and are therefore terminal to the switchboard. Failure of this equipment would likely be catastrophic, resulting in explosion and fire and extended interruption to electricity supply.

Protection and control systems are critical to the safe and reliable operation of the network. These systems are designed to detect the presence of power system faults and/or other abnormal operating conditions, and to automatically isolate the faulted network by the opening of appropriate high-voltage circuit breakers. Failure to isolate power system faults will invariably result in severe damage to network assets, presenting a serious health and safety hazard to the public, and greatly increases the risk of fire-starts. The original secondary assets at CW including electromechanical protection relays

[3] protection, control, monitoring, D.C. supplies, communications equipment and wiring.

[4] circuit breakers, current transformers, voltage transformers, isolation switches and associated switchboard.

are also experiencing condition deterioration, and are technically obsolete with limited spares, and no longer supported by vendors. All of these factors increase the likelihood of a power system fault not being detected and safely isolated, or a maloperation. This poses a serious safety and reliability risk for the ongoing fault protection coverage of CW and its distribution network. For any faults not effectively cleared by the local CW protection, this will back up to upstream supply protection devices increasing the amount of load impacted and the number of customers with supply at risk, impacting areas of the inner eastern Melbourne metropolitan area greater than just the CW supply area.

The asset management need at CW is to maintain a safe and reliable supply of electricity to customers in the CW supply area. This recognises the risks associated with the existing switchboard, including the increasing probability, severity, and consequence of failure—for example:

- deterioration in compound-filled assets is typically monitored by measuring partial discharge activity, with changes in partial discharge activity providing early warnings of impending failure; partial discharges have been detected within the switchboard;
- the compound-filled cable termination boxes and this switchboard are not designed to contain arc-faults, creating the potential for adverse safety outcomes associated with explosive failures;
- the configuration and loading of CW are such that a fault would be expected to negatively impact on CitiPower’s ability to supply load to the CW supply area and surrounds;
- good asset management practice from the broader industry supports the view that compound-filled and non-arc fault contained equipment pose an increasing safety and reliability risk, and should be progressively removed from service.

The identified need at CW is to:

I. protect power sector workers and members of the public from harm caused by equipment failure (Safety); and
II. continue to maintain a reliable power supply to the residences and businesses that are dependent on the supply from this distribution network (Reliability).

Solutions to the identified need shall manage and mitigate the increasing risk of secondary asset and switchgear failure, to maintain safety and reliability of electricity supply to CitiPower’s customers and workforce within the CW supply area. Solutions need to support CitiPower plans to reduce the population of non-arc fault contained switchboards that comprise oil filled circuit breakers and electromechanical protection and control relays.

4.3 Quantification of the Identified Need

Table 2 summarises the forecast impact of the identified network need discussed in Section 4.2 on customers. The table shows over a 15-year forecasting period, the risk costs and hence the potential market benefits considered, including:

- Expected unserved energy (EUE) cost, which is the value of the energy at risk after taking into account the probability of asset failures or malfunctions at CW, representing the deterioration in supply reliability within the CW supply area.
- Safety risk cost, which is the cost of harm to CitiPower’s staff and the general public located within the CW supply area, as a result of anticipated safety incidents caused by asset failures or malfunctions at CW.
- Total risk which is the sum of the EUE cost and the safety risk cost.

Table 2: CW Reliability and Safety Risk Qualification ($'000, Real 2025)

Financial Year	Expected Unserved Energy Cost	Safety Risk Cost[5]	Total Risk Cost
2025	700	44	744
2026	1,222	45	1,266
2027	1,262	46	1,307
2028	1,292	47	1,339
2029	1,318	49	1,367
2030	1,343	51	1,394
2031	1,373	53	1,426
2032	1,416	56	1,473
2033	1,455	60	1,515
2034	1,475	65	1,539
2035	1,478	71	1,548
2036	1,482	78	1,560
2037	1,487	89	1,576
2038	1,495	103	1,597
2039	1,506	121	1,627

For the purposes of this RIT-D, a 25-year assessment horizon has been adopted in line with typical asset life cycles and standard regulatory practice under the RIT-D framework.

[5] For simplicity, no AFAP disproportionate factors have been applied to the Safety Risk Cost.

5. Key Assumptions in Relation to the Identified Need

5.1 Method of Quantifying the Identified Need

CitiPower adopts its Asset Risk Quantification Guide in quantifying safety and reliability risks associated with asset condition failures and their consequences.

5.1.1 Safety

The safety risk to CitiPower employees and the general public, arising from potential failure or malfunction of network assets is quantified by CitiPower using a safety risk cost, based on the asset conditions. The ability to maintain a safe network for the CW supply area is increasingly difficult due to the poor and deteriorating condition of the CW secondary system and switchgear assets.

CitiPower's approach to safety risk is based on the As Far As Practicable (AFAP) principle. The AFAP principle recommends safety risk reduction measures be implemented unless the cost, time or form of the risk reduction measure is grossly disproportionate to the benefit gained from the reduced risk. A "Do Nothing" (or run to failure) approach would result in the poor condition assets remaining in service, deteriorating further, and completely failing to address any safety concerns.

5.1.2 Reliability

CitiPower's reliability planning standard for its zone substation assets is based on a probabilistic planning approach which quantifies Expected Unserved Energy (EUE) defined in terms of megawatt hours (MWh) per annum of energy not supplied, taking into account the unavailability of an asset due to a failure or malfunction, and expresses this financially by applying a Value of Customer Reliability (VCR) ($/MWh).

5.2 Forecast Maximum Demand

CW is located immediately north-east of Melbourne's CBD. It supplies electricity to approximately 9,739 customers to parts of Collingwood and Fitzroy, with the majority of the load at CW comprising of high density commercial and residential customers.

A credible network, non-network or SAPS solution should consider the forecast maximum demand for the CW supply area shown in Table 3. Forecasts of the 10% PoE and 50% PoE summer maximum demand and power factor at CW are presented. These forecasts are based on an expected economic growth scenario.

Table 3: CW Maximum Demand Forecast

Financial Year Ending	Power factor	10% PoE (MVA)	50% PoE (MVA)
2026	0.99	32.2	28.2
2027	0.99	50.1	44.0
2028	0.96	51.2	45.0
2029	0.99	52.3	45.9
2030	0.99	53.4	46.9

5.3 Forecast Annual Energy

A credible network, non-network or SAPS solution should consider the annual energy requirements of customers within the CW supply area as shown in Table 4.

Table 4: CW Annual Energy

Financial Year Ending	Energy (GWh pa)
2026	106
2027	166
2028	170
2029	173
2030	177

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 50% PoE year.

The annual demand profile at CW expressed as a percentage of the 50% PoE maximum demand listed in Table 3, is illustrated in Figure 3.

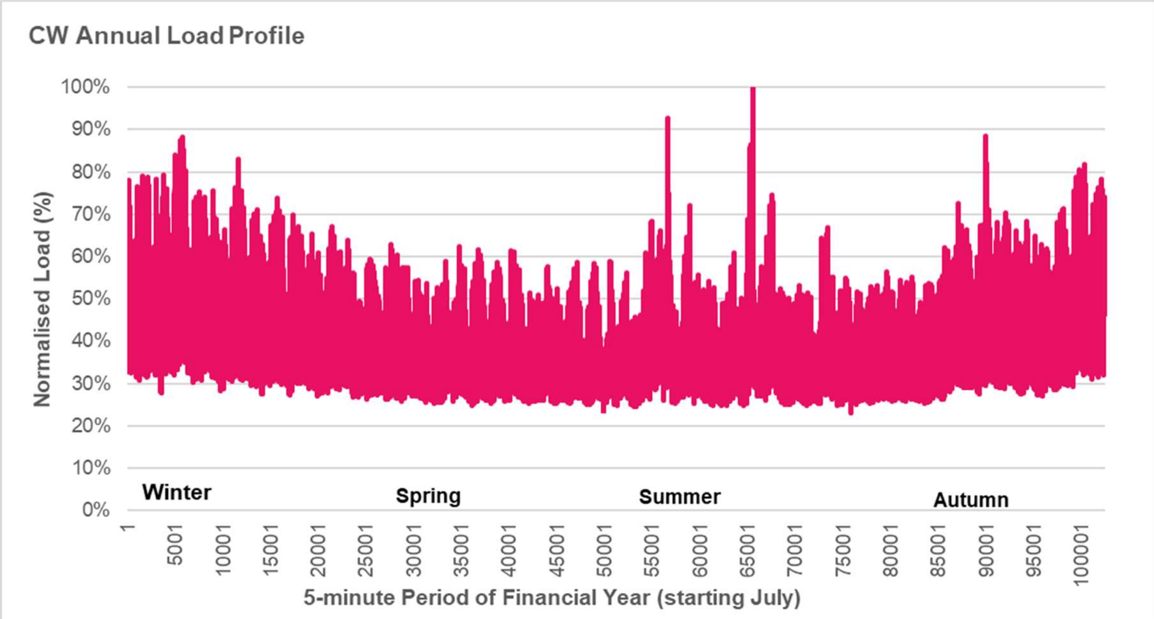

Figure 3: Annual Load Profile at CW

The coincident maximum demand of the customers within the CW supply area occurs during days of extreme ambient temperature.

The load profile on the day of a 50% PoE summer maximum demand is illustrated in Figure 4. The prominence of commercial and residential load within the CW supply area (with a relatively small numbers of solar PV panels), results in a demand rising steadily during the day with the peak occurring in the mid to late afternoon.

Figure 4: Load Profile on Day of Summer Maximum Demand at CW

Figure 5 shows the normalised CW annual load-duration curve for a 50% PoE summer maximum demand year.

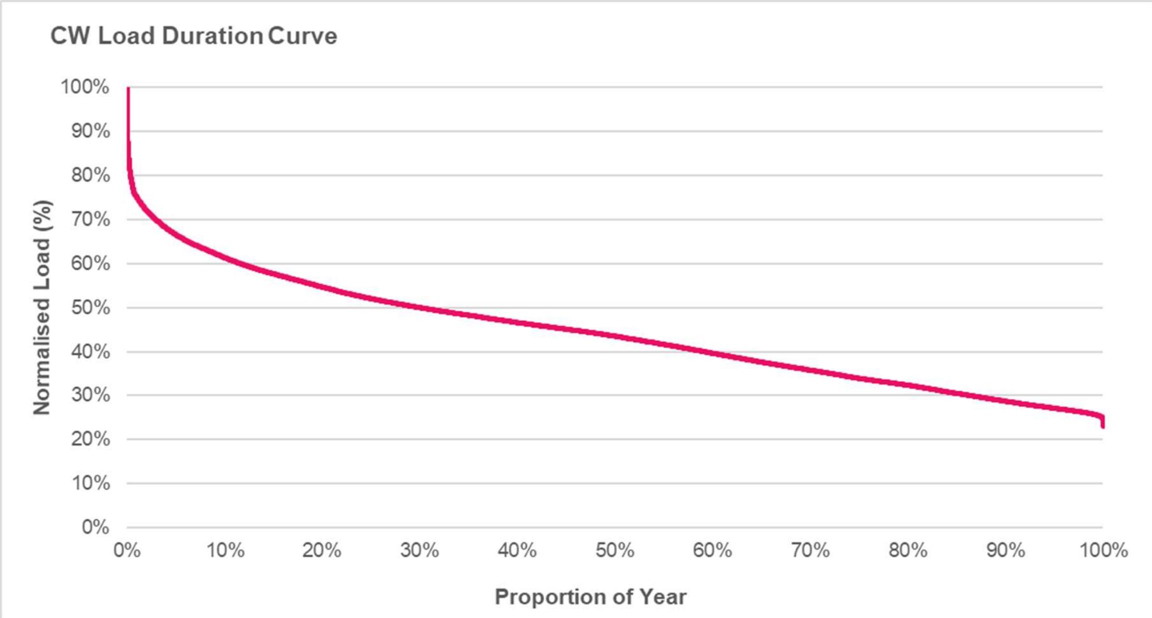

Figure 5: Annual Load-Duration Curve at CW

The load characteristics can vary marginally from year to year due to changes in weather, and underlying changes in the customers' load usage. Figure 5 shows that load in excess of 80% of the maximum demand lasts for less than 1% of the year indicating that CW has 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 the load transfer capability between CW and the neighbouring networks of B and F zone substations (among others) to be 0.76 MVA for summer 2024/25.

With the planned retirement of Fitzroy Zone Substation (ZSS F), CW is expected to progressively pick up additional load, resulting in a step change in both demand and supply risk exposure over the coming years. Accordingly, the future load transfer capability between CW and adjacent substations is not expected to remain constant, and the system could become increasingly constrained without investment.

A credible network, non-network or SAPS solution should provide for supply to be restored within 50 minutes (on average) following the loss of a plant item causing an outage.

5.6 Asset Ratings

The existing capabilities of CW zone substation for summer and winter are presented in Table 5 for all transformers in service (N), and for one transformer out of service (N-1).

Table 5: Summary of CW Ratings (MVA)

Power Flow Condition	Summer Cyclic Rating at 40°C		Winter Cyclic Rating at 10°C	
	N	N-1	N	N-1
Import[6]	65.3	34.4	73.4	38.2

[6] Power flow towards customer load.

Export[7]	-54.0	-27.0	-54.0	-27.0

5.7 Value of Customer Reliability

Location-specific Value of Customer Reliability (VCR) is used to value reliability of supply. The locational VCR for the CW 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 6.

Table 6: Summary of Location Specific VCR

Zone Substation	VCR ($ per MWh, Real 2025)
CW	34,050

5.8 Costs

The costs for each network option have been calculated based on our cost estimation database using recent similar project costs and scope. Costs are fully loaded, escalated to 2025, and expected to be within ±30% of the actual cost. Ongoing O&M (relative to the base case) are included from the year after the capital investment.

5.9 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.

[7] Power flow towards the transmission network.

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 Collingwood Zone Substation (CW) Secondary Assets and Switchgear Condition identified need.

To address the safety need, credible network, non-network or SAPS options would be required to have characteristics that would allow the safe decommissioning or rectification of the CW secondary systems and 11 kV switchgear and switchboard.

Furthermore, to address the reliability need in anticipation of the safe decommissioning of CW, credible options would need to be capable of supplying the annual energy requirements of customers supplied by CW, and the forecast maximum demand at CW over the planning horizon, taking into account the available load transfer capacity.

Table 7 provides a summary of the base case option, using the risk costs presented earlier in Table 2.

Table 7: Base Case

Option	Description
Do Nothing (status quo)	This base case option involves running the CW secondary systems and 11 kV switchgear and switchboard to failure. That is, continue with existing maintenance of this equipment, coupled with replacement upon failure. This option does not address the identified need as it does not address the growing network reliability and safety risks. The present value of all risk costs (EUE and safety risk) is $25.11 million (Real, 2025).

Table 8 provides a summary of credible options that could address the identified need.

Table 8: Credible Options Under Consideration

Option	Description
1. Replace existing switchboard, switchgear and secondary systems in the same building	This option replaces the entire 11 kV switchboard and secondary systems within the existing building, requiring a two-year construction time. The total capital cost of this option is $17.06 million (Real, 2025), comprising $13.56 million of direct costs and 25.7% of overheads. Operating costs are expected to be $0.5k per annum lower than the base case for this option. This option is expected to deliver a substantially lower risk compared to the base case, being developed to address the identified need in its entirety. The present value of all costs (capital, O&M, EUE and safety risk) is $20.00 million (Real, 2025).
2. Establish a new switchboard, switchgear and secondary systems in a new switch-room building	This option installs a new 11 kV switchboard and secondary systems in a new switch-room building, allowing the existing CW switchboard and secondary systems to be decommissioned, requiring a three-year construction time. The total capital cost of this option is $33.00 million (Real, 2025), comprising $26.23 million of direct costs and 25.7% of overheads. Operating costs are expected to be $0.5k per annum lower than the base case for this option. This option is expected to deliver a substantially lower risk compared to the base case, being developed to address the identified need in its entirety. The present value of all costs (capital, O&M, EUE and safety risk) is $35.27 million (Real, 2025).

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 9 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 9: Options Regarded as being Not Credible

Option	Description
Decommission CW and transfer all load to surrounding zone substations.	This option allows for the decommissioning of CW by transferring all of its load to the adjacent zone substations F and B. Referring to Table 10, 52.1 MW of new feeder capacity (at least 8 new high voltage 11 kV feeders) would need to be established to transfer CW's entire load base to these zone substations. Both B and F would need to be augmented with an additional transformer. Given the scale of the works required to achieve this outcome would be in excess of $60 million, this option is not regarded as credible.
Power factor correction	The power factor at CW is currently 0.99 at times of maximum demand, and there is negligible opportunity to reduce demand at the network or customer level as seen by CW. Therefore, this option is not credible, because it cannot technically address the identified need in relation to reliability or safety risks associated with deteriorating asset condition.
Demand response programmes	Demand response programs are generally designed for peak demand management. 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 CW supply area to disconnect from the network. Hence this option is not credible.
Customer and/or community intermittent renewable generation and energy storage	Referring to Table 10, distributed generation of up to 52.1 MW using solar PV is likely to require more than 80 hectares of land[8]. Devoting this amount of land to energy production in a dense, urban environment (especially in an inner metropolitan setting) is unlikely to be feasible. Nevertheless, coupling this with customer solar PV installations in the CW supply area, particularly with the availability of commercial and residential roof-space and future changes in PV technology to integrate PV into high-rise buildings, could reduce the amount of additional generation required. Currently CW has only 2.62 MW of installed rooftop solar PV capacity. The challenge however lies in the provision of storage to back-up the solar PV panels when they are not operating (including during the evenings). A viable storage option that meets the maximum demand at CW and reliably meets customer requirements requires 'N' batteries (where 'N' ≥ 2) each able to supply (52.1 ÷ N) MWp, each with an energy to power ratio of around ten[9]. 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 $0.85 million per MWh[10], totalling $445 million[11] (excluding land). Adding generation, demand management or efficiency measures to this option would reduce the battery size requirements. 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 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.

[8] How much land do I need to build a 5 MW Solar farm?, Powertech Energy.

[9] 197,000 MWh pa / 365 days pa / 52.1 MW = 10.

[10] 2024 Cost and Technical Parameter Review, Aurecon, Table 9-3, 170.5 / (200 x 1) = $0.85 million per MWh.

[11] 0.85 x 10 x 52.1 = $445 million.

Option	Description
Dispatchable generation and/or Customer standby generation	Referring to Table 10, a viable generation option that meets the maximum demand at CW 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 (52.1 ÷ 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 $1.2 million per MW[12]. For 52.1 MW of generation, the cost will be over $63 million[13], excluding land, connection and operating costs. Adding storage, demand management or efficiency measures to this option would reduce the generation requirements stated above, and potentially the 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.

[12] 2024 Cost and Technical Parameter Review, Aurecon, Table 4-31, $1,189 per kW.

[13] 52.1 x 1.2 = $63 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 CW and would need to be capable of supplying the annual energy requirements of all customers supplied by CW, and the maximum demand at CW over the planning horizon.

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 10 outlines the estimated amount of load reduction, or additional generation needed to be supplied by a credible non-network or SAPS solution within the CW supply area to address the identified need. These are the minimum requirements, because the values reflect the reduced requirement needed due to the availability of load transfer capability away from CW to its surrounding zone substations.

Table 10: Peak Demand and Annual Energy Network Support Required from Non-Network or SAPS Solutions

Financial Year Ending	Load at Risk (MVA)	Hours at Risk (Hours)	Expected Minimum Support Required	
			Energy (GWh pa)	Power (MWp)
2026	31.5	8760	118	31.1
2027	49.3	8760	184	48.8
2028	50.4	8760	189	49.9
2029	51.5	8760	193	51.0
2030	52.6	8760	197	52.1

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 CW supply area maximum demand and annual energy, utilising the available transfer capability. This service is required no later than by the end of 2026[14].

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 CW 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 Distribution Connected Embedded Generation Customer Guideline[15].

[14] Commissioning year of proposed preferred network option.

[15] High Voltage Distribution Connected Embedded Generation Customer Guideline, CitiPower.

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 CW supply area (following the safe decommissioning of CW), 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 Collingwood Zone Substation (CW) Secondary Assets and Switchgear Condition identified need, is higher than the trigger threshold of $14 million[16] for the publication of and consultation on a Draft Project Assessment Report (DPAR).

Therefore, CitiPower shall now prepare and publish a 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 proposed 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 proposed preferred option against the alternative options considered.

CitiPower intends to publish the DPAR by 27 June 2025.

For the purposes of referencing this RIT-D, this RIT-D is referred to as the "***Collingwood Zone Substation (CW) Secondary Assets and Switchgear Condition***" identified need.

16 2024 cost thresholds review for the regulatory investment test | Australian Energy Regulator (AER).

Appendix A: CW Site Photos

Figure 6: Existing 1960's Email J Series Indoor Metal Clad Switchboard

Figure 7: Existing 1960’s Electromechanical Protection and Control Relays and Secondary Asset Panels