RIT-D: Collingwood (CW) Supply Area – Draft 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 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.

1.2 Purpose

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

The purpose of this report is to identify the proposed preferred option to address the identified need, associated with the network safety and reliability limitations within the CW supply area. This report has been prepared following the publication of the Notice of Determination Report and represents the second stage of the RIT-D process.

1.3 Notice of Determination Report

On 27 June 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 Standalone 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 CW supply area.

1.4 Draft Project Assessment Report

Following publication of the Notice of Determination Report, CitiPower is required to prepare and publish a Draft Project Assessment Report (DPAR), as required under NER clause 5.17.4, paragraph (i), as the total cost of the most expensive credible network option to address the identified need, is more than the trigger threshold of $14 million[1] for the publication of, and consultation on, a DPAR.

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

- Provide background information on the network servicing the CW supply area and its limitations;
- Describe the need which CitiPower is seeking to address, with the assumptions used in identifying that need;
- Describe the credible options that are considered in this RIT-D assessment;
- Explain the materiality of each class of market benefit;

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

- Describe the methods used in quantifying each material market benefit;
- Quantify costs, high-level cost breakdowns, and material market benefits for each of the credible options;
- Present the results of an NPV analysis, with explanatory statements regarding the results;
- Identify the proposed preferred option, its costs, optimum timing and its technical characteristics; and
- Provide contact details and next steps for this RIT-D consultation.

1.5 The Identified Need

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.

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.

Table 1 summarises the forecast financial impact of the identified need on reliability and safety for customers within the CW supply area, expressed as the Expected Unserved Energy (EUE) cost and the safety risk cost respectively.

Table 1: Forecast Impact of the Identified Need – Safety and Reliability ($'000, Real 2025)

Financial Year	EUE Cost	Safety Risk Cost[2]	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.

Table 2 provides a summary of the base case option, using the risk costs presented in Table 1.

Table 2: 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).

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

1.6 Credible Options for Addressing the Identified Need

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

Table 3: 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).

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. In order 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.

1.7 Scenarios and Sensitivities Considered

In order 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	70%	100%	130%
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 a number of 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 CW supply area, are changes in the demand for electricity and

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

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% of central scenario; and 25% of high scenario).

1.8 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 25-year period.

Table 6: Present Value of Net Market Benefits of Credible Options - Scenarios ($’000, Real 2025)

Scenario	Do Nothing		Option 1		Option 2	
	Net Market Benefit	Ranking	Net Market Benefit	Ranking	Net Market Benefit	Ranking
Weighted	0	2	4,977	1	(10,271)	3
Central	0	2	5,112	1	(10,165)	3
Low	0	2	210	1	(14,086)	3
High	0	2	9,476	1	(6,670)	3

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 proposed preferred option for investment in the CW supply area is therefore Option 1 (i.e., Replace existing CW switchboard, switchgear and secondary systems in the same building). Option 1 satisfies the requirements of the RIT-D.

The robustness of the proposed 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 ($'000, Real 2025)

Sensitivity for Central Scenario	Option 1	Option 2
All Variables: Base values	5,112	(10,165)
Maximum demand: Lower bound	3,155	(11,714)
Maximum demand: Upper bound	6,091	(9,390)
Capital and operational costs: Lower bound	10,057	(1,578)
Capital and operational costs: Upper bound	167	(14,679)
Value of customer reliability: Lower bound	1,197	(13,264)
Value of customer reliability: Upper bound	9,026	(7,066)
Discount rate: Lower bound	11,827	(5,103)
Discount rate: Upper bound	584	(6,384)
Asset failure rates: Lower bound	1,873	(12,769)
Asset failure rates: Upper bound	8,350	(7,561)

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

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 avoided EUE and safety risk cost (i.e., the annualised cost of the total avoided risk) exceeds the annualised cost of the preferred option (i.e., the annualised investment cost). 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 2025)					Optimum Timing[4]
	2025	**2026**	**2027**	**2028**	**2029**	
Weighted	(17)	502	543	574	602	2025/26
Central	(12)	510	551	583	611	2025/26
Low	(183)	217	248	272	294	2025/26
High	140	771	820	858	892	2024/25

Under the Weighted Scenario, the optimum timing is identified as 2025/26. Considering the two-year lead time for implementing this option, the optimum timing of Option 1 is 2026/27 (i.e., prior to November 2026).

[4] The economic analysis concludes the optimum timing is 2025/26 however the preferred option cannot be constructed within this timeframe. Instead it can be constructed before the 2026/27 summer.

1.9 Proposed Preferred Option

The proposed preferred option is Option 1 because it 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. This option addresses both the safety need and reliability need.

The proposed preferred option involves replacing the existing CW 11 kV switchgear, switchboard and secondary systems in the same substation building.

The proposed 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 proposed preferred option is no later than November 2026.

The proposed preferred option has a total capital cost of $17.06 million (Real, 2025).

The 25-year present value of net market benefits associated with the proposed preferred option is $4.98 million (Real, 2025).

1.10 Next Steps

In accordance with the provisions set out in clause 5.17.4, paragraph (m) of the NER, Registered Participants or interested parties may, within 6 weeks after the publication of this report, provide submissions on the draft conclusions made by CitiPower in this report.

Accordingly, Registered Participants and interested parties who wish to provide submissions on the recommendations outlined in this report must do so by 8 August 2025. Any parties wishing to make a submission should send their submission to CitiPower at ritdenquiries@citipower.com.au

Submissions will be reviewed following the closure date.

The total capital cost of the proposed preferred option to address the identified need, is less than the trigger threshold of $28 million[5] for the publication of a separate Final Project Assessment Report (FPAR). Therefore the preferred option will be confirmed in our 2025 Distribution Annual Planning Report (DAPR), expected to be published in December 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.

[5] 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 Draft Project Assessment Report (DPAR) has been prepared by CitiPower in accordance with the requirements of clause 5.17.4, paragraph (j) of the National Electricity Rules (NER) version 230, and is consistent with the Australian Energy Regulator's (AER) RIT-D Application Guidelines[6] and the Industry Practice Application Note for Asset Replacement Planning[7].

The publication of this DPAR represents the second 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 risks within the CW supply area. The associated Notice of Determination report in relation to this RIT-D was published on 27 June 2025.

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)[8].

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

- Provide background information on the network servicing the CW supply area and its limitations;
- Describe the need which CitiPower is seeking to address, with the assumptions used in identifying that need;
- Describe the credible options that are considered in this RIT-D assessment;
- Explain the materiality of each class of market benefit;
- Describe the methods used in quantifying each material market benefit;
- Quantify costs, high-level cost breakdowns, and material market benefits for each of the credible options;
- Present the results of an NPV analysis, with explanatory statements regarding the results;
- Identify the proposed preferred option, its costs, optimum timing and its technical characteristics; and
- Provide contact details and next steps for this RIT-D consultation.

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[6] AER: "AER – RIT-D Application Guidelines – November 2024". Available at: https://www.aer.gov.au/system/files/2024-11/AER%20-%20RIT-D%20application%20guideline%20%28clean%29%20-%2021%20November%202024.pdf

[7] 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

[8] 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 9: 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
FPAR	Final Project Assessment Report
LTI	Lost Time Injury
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)
VSL	Value of Statistical Life

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.

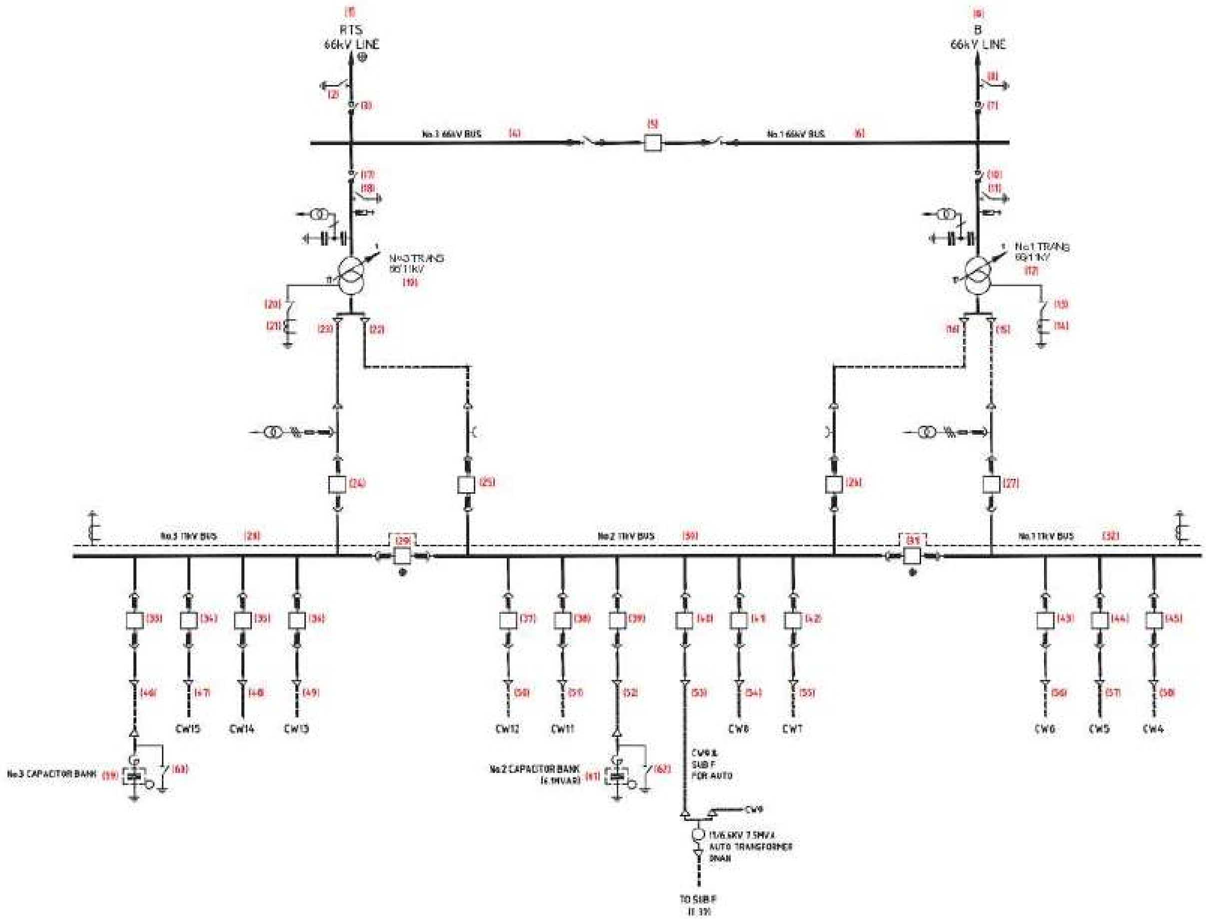

Figure 1: CW Electrical Single Line Diagram

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.

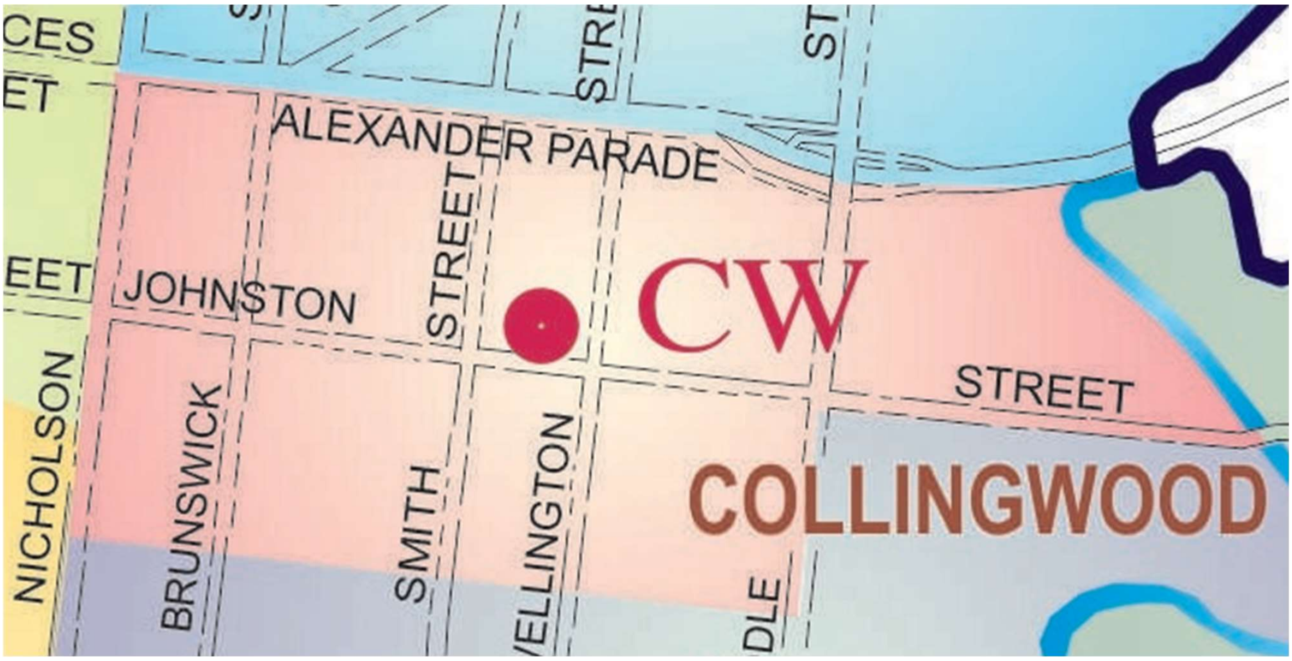

Figure 2: CW Supply Area

4.2 Description of the Identified Need

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, switchgear 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[9] and switchgear[10] 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 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

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

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

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 10 summarises the forecast impact of the identified network need discussed in Section 4.2 on customers. The table shows over a 15-year period, the risk costs and hence the classes 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 10: CW Reliability and Safety Risk Quantification ($'000, Real 2025)

Financial Year	Expected Unserved Energy Cost	Safety Risk Cost[11]	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.

Table 11 provides a summary of the base case option, using the risk costs presented in Table 10.

Table 11: 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).

[11] 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. CitiPower calculates the impact of changes in safety and reliability (in the form of involuntary load shedding), by comparing the total value of the safety cost and value of EUE under the base case (where no action is undertaken by CitiPower) with each of the credible options in place using the assumptions below.

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 an annualised safety risk cost, based on the asset conditions. The safety risk cost provides a measure of the expected financial value of the safety risk event. The safety risk cost is defined as the probability weighted cost of consequences, with the likelihood of consequences being the moderating factor in quantifying the risk.

The Electricity Safety Act[12] requires CitiPower to design, construct, operate, maintain, and decommission its network to minimise hazards and risks to the safety of any person as far as reasonably practicable, or until the costs become disproportionate to the benefits from managing those risks. As such, CitiPower's approach to safety risk is based on the As Far As Practicable (AFAP) principle.

In implementing this principle for assessing safety risks from asset condition failures, CitiPower uses a Value of Statistical Life (VSL) to estimate the benefits of reducing the risk of death, a value of Lost Time Injury (LTI) to estimate the benefits of reducing the risk of injury, and a disproportionality factor[13] CitiPower notes that this approach, including the use of a disproportionality factor, is consistent with practice notes provided by the AER[14] , and is the approach taken by other network service providers within the NEM.

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 annualised EUE (in MWh per annum) of energy not supplied, taking into account the network capacity, demand characteristics, unavailability of an asset due to a failure (or malfunction), and the restoration time. The value of EUE is expressed financially by multiplying the EUE with a locational 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.

Forecasts of the 10% PoE and 50% PoE summer maximum demand and power factor at CW are presented in Table 12. These forecasts are based on an expected economic growth scenario.

[12] Victorian State Government, Victorian Legislation and Parliamentary Documents, Electricity Safety Act 1998. Available at: https://www.legislation.vic.gov.au/in-force/acts/electricity-safety-act-1998/081.

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

[14] 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.

Table 12: 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

Forecasts of the net annual energy requirements of customers within the CW supply area as shown in Table 13.

Table 13: 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

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 12, is illustrated in Figure 3.

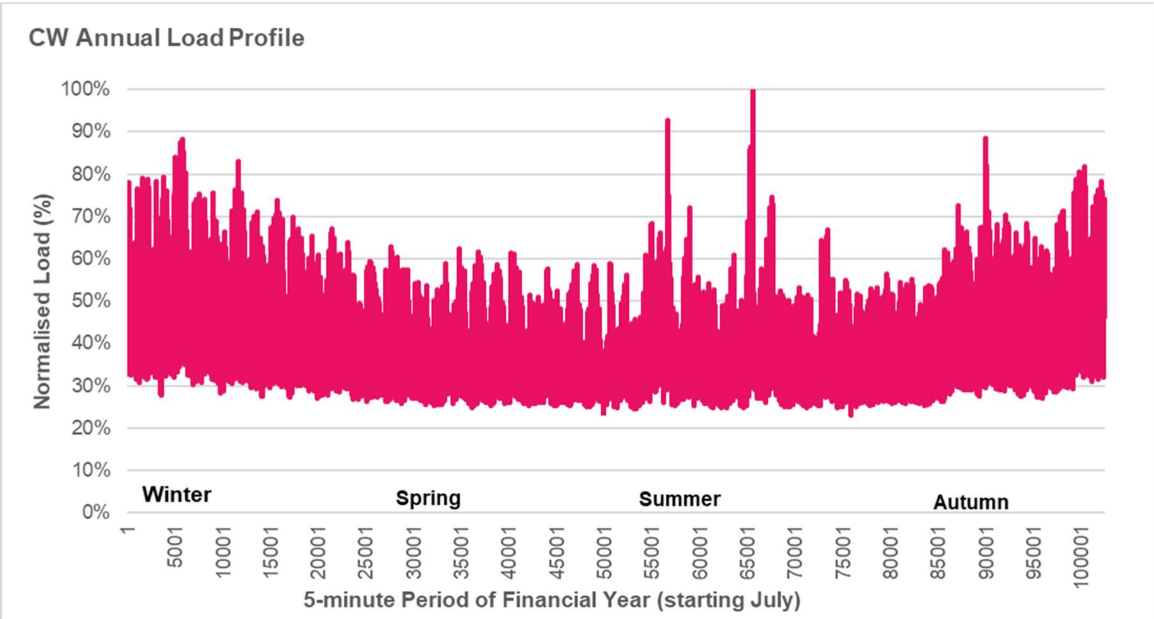

Figure 3: Annual Load Profile at CW

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.

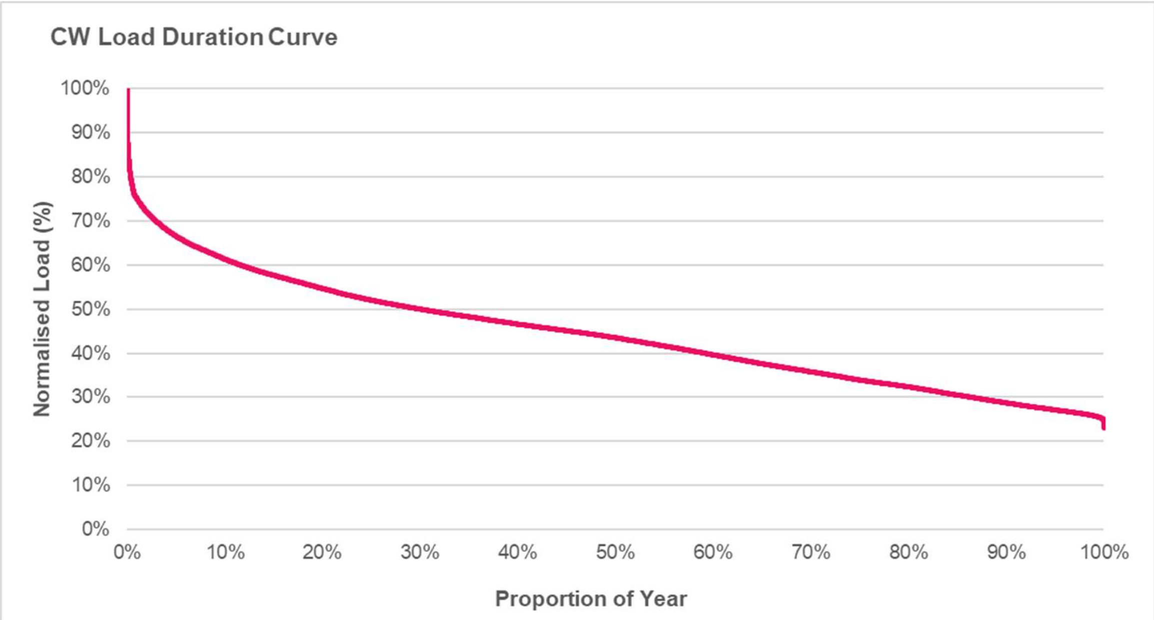

Figure 5: Annual Load Duration Curve at CW

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

The load transfer capability between CW and the neighbouring networks of B and F zone substations (among others) is 0.76 MVA for summer 2024/25.

However, 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.

Customers' supply is normally restored within 50 minutes (on average) following the loss of a major plant item (i.e., a zone substation transformer, or distribution feeder) but this restoration time may become less reliable under increased loading conditions without mitigating action.

5.6 Asset Ratings

The existing capabilities of CW zone substation for summer and winter are presented in Table 14 for all transformers in service (N), and for one transformer out of service (N-1).

Table 14: 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[15]	65.3	34.4	73.4	38.2
Export[16]	-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 15.

Table 15: Summary of Location Specific VCR

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

5.8 Asset Failure Rates

The base (average) reliability and safety consequence data adopted in this assessment is presented in Table 16, Table 17 and Table 18 below. The data is based on observed CitiPower asset failure rates.

Table 16: Summary of Asset Failure Rates and Hazard Function (Weibull Distribution Parameters)

Equipment	α parameter	β parameter
Electro-mechanical Relay (Failure to Operate)	6.0	75
Analogue Relay (Failure to Operate)	4.0	56
Digital / Numerical Relay (Failure to Operate)	3.0	36

15 Power flow towards customer load.

16 Power flow towards the transmission network.

Equipment	α parameter	β parameter
Switchgear (Failure)	6.8	69

Table 17: Summary of Asset Reliability Consequence Probability

Equipment	Consequence	Probability
Electro-mechanical Relay (Reliability)	Bus Outage Feeder Outage	37% 16%
Analogue Relay (Reliability)	Bus Outage Feeder Outage	32% 16%
Digital / Numerical Relay (Reliability)	Bus Outage Feeder Outage	21% 9%

Table 18: Summary of Asset Safety Consequence Probability

Equipment	Consequence	Probability
All Protection Relays (Safety)	Injury Death – Public Death – Staff	0.0260% 0.0115% 0.1960%

5.9 Value of Safety Consequence

Values of safety consequence used in this RIT-D are derived from various sources including Safe Work Australia[17] for LTI, and the Department of Prime Minister and Cabinet, Best Practice Regulation Guidance Note[18] for VSL, (adjusted to Real 2025). These values of safety consequence are summarised in Table 19.

Table 19: Summary of Safety Consequence Values

Safety Consequence	Value of Safety Consequence ($'000, Real 2025)
Injury (LTI)	154
Death (VSL)	5,492

[17] 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.

[18] 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.

6. Credible Options

CitiPower presented seven options (network, non-network and SAPS) in the Notice of Determination report. Only two 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 20.

Table 20: 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).

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. In order 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.

7. 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.

The RIT-D economic analysis has been undertaken over a 25-year period, commensurate with the long-lived nature of the investments considered in this RIT-D assessment.

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

7.1 Classes of Market Benefits Considered Material

In order to measure the increase in net market benefit, CitiPower has analysed the classes of market benefits required to be considered by the RIT-D[19]. The classes of market benefits that are considered material and have been quantified in this RIT-D assessment are:

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

- Changes in safety risk costs[20]; and
- Changes in involuntary load shedding.

7.1.1 Changes in Safety Risk Cost

Reducing the likelihood of asset failure by addressing poor condition assets provides 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 CW, the safety risk cost is considered to be material. The method used by CitiPower in quantifying changes in safety risk cost is described in Section 5.1.1.

7.1.2 Changes in Involuntary Load Shedding and Customer Interruptions

Reducing the likelihood of asset failure by addressing poor condition assets provides a greater reliability for the supply area, by reducing potential supply interruptions and the consequential risk of involuntary load shedding. At CW, the reliability risk cost (expressed as the value of EUE) is considered to be material. The method used by CitiPower in quantifying changes in involuntary load shedding is described in Section 5.1.2.

7.2 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 greenhouse gas emissions;
- Difference in timing of expenditure; and
- Additional option value.

7.2.1 Changes in Load Transfer Capacity and the Capacity of Embedded Generating Units

This RIT-D 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. The transfer capability between CW and adjacent zone substations is minimal and not expected to materially differ between options.

Furthermore, 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. The CW supply area has limited embedded generation capacity and no anticipated changes that would impact this RIT-D.

7.2.2 Changes in Electrical Energy Losses

The differences in electrical energy losses between credible options and with the base case is considered to be negligible due to the nature of the equipment being replaced.

7.2.3 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 available for curtailment, and for actually 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 CW supply area. It was identified from that report that the potential for voluntary load curtailment was immaterial to address the

[20] 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

identified need. Therefore, this market benefit is not quantified for this RIT-D, as it was considered to be not material to differentiate between credible options, or with the base case.

Past investigations found no viable demand-side participation options in this area.

7.2.4 Changes in Costs to Other Parties

There are no material market benefits (or costs) associated with changes in costs to other parties in this instance. There are no affected third-party connection assets or market participant impacts.

7.2.5 Changes in 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 have an impact on wholesale market generation dispatch, renewable energy curtailment, nor levels of SF_6 leakage from high-voltage switchgear. The options do not materially change these contributors of greenhouse gas emissions, so emissions impacts are not relevant.

7.2.6 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 CW supply area. The investment need is urgent and condition-driven, with little room for timing deferral or strategic delay.

7.2.7 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 CW 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 further deteriorating over time, 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.

7.3 Costs of Credible Options

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.

The capital and operating cost assumptions for each credible option considered in this RIT-D assessment are summarised in Table 21.

Table 21: Capital and Operating Costs of Credible Options ($'000, Real 2025)

Option	Capital Cost	Operational Cost (pa)
Base Case - Do Nothing	0	0
Option 1 - Replace existing switchboard, switchgear and secondary systems in the same building	17,057	(0.5)
Option 2 - Establish a new switchboard, switchgear and secondary systems in a new switch-room building	32,984	(0.5)

The 25-year present value of capital, operating and risk costs for each credible option considered in this RIT-D assessment are summarised in Table 22.

Table 22: Present Value of Costs of Credible Options ($'000, Real 2025)

Option	Capital Cost	Operational Cost	Investment Cost (Net)	Risk Cost	Total Cost
Base Case - Do Nothing	0	0	0	25,108	25,108
Option 1	16,484	(6)	16,478	3,518	19,996
Option 2	27,529	(5)	27,524	7,748	35,273

7.4 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 takes into account 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 CW supply area, are changes in the demand for electricity, and changes in the asset failure rates. Table 23 lists the variables and ranges adopted for the purpose of defining scenarios.

Table 23: 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%

7.5 Sensitivities

In order 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 24 lists the variables and ranges adopted for the purpose of informing sensitivity analysis.

Table 24: Sensitivity Analysis Variables

Sensitivity Testing	Lower Bound	Base Value	Upper Bound
Maximum demand	90%	100% - Refer Section 5.2	105%
Capital and operational costs	70%	100% - Refer Section 7.3	130%
Value of customer reliability	80%	100% - Refer Section 5.7	120%
Discount rate	2.22%	4.43% - Refer Section 7.6	6.65%
Asset failure rates	85%	100% - Refer Section 5.8	115%

7.6 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 in the cost-benefit analysis for this RIT-D. For the high sensitivity test we use 150% of this discount rate, being 6.65%. For the low sensitivity test we use 50% of this discount rate, being 2.22%.

8. 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.

8.1 Gross Market Benefits

The gross market benefit is the sum of each of the individual categories of material market benefit, as quantified on the basis of the approach set out in Section 7.1, expressed in present value terms over the 25-year analysis period.

Table 25 and Table 26 summarise the present value of gross market benefits of Option 1 and Option 2 respectively.

Table 25: Gross Market Benefits Option 1 - Replace existing switchboard and secondary systems in the same building

Option 1 Scenario	Present Value ('000, Real 2025)		
	Avoided EUE Risk	**Avoided Safety Risk**	**Gross Market Benefit**
Weighted	19,438	2,017	21,455
Central	19,572	2,017	21,590
Low	14,973	1,715	16,688
High	23,634	2,320	25,954

Table 26: Gross Market Benefits Option 2 - Establish a new switchboard and secondary systems in a new building

Option 2 Scenario	Present Value ('000, Real 2025)		
	Avoided EUE Risk	**Avoided Safety Risk**	**Gross Market Benefit**
Weighted	15,387	1,866	17,253
Central	15,494	1,866	17,360
Low	11,853	1,586	13,439
High	18,709	2,146	20,854

Figure 6 shows the breakdown of gross market benefits for Option 1 and Option 2 for each year up to 2041 under the Central Scenario, assuming an implementation completion date of 2026/27 and 2030/31 respectively.

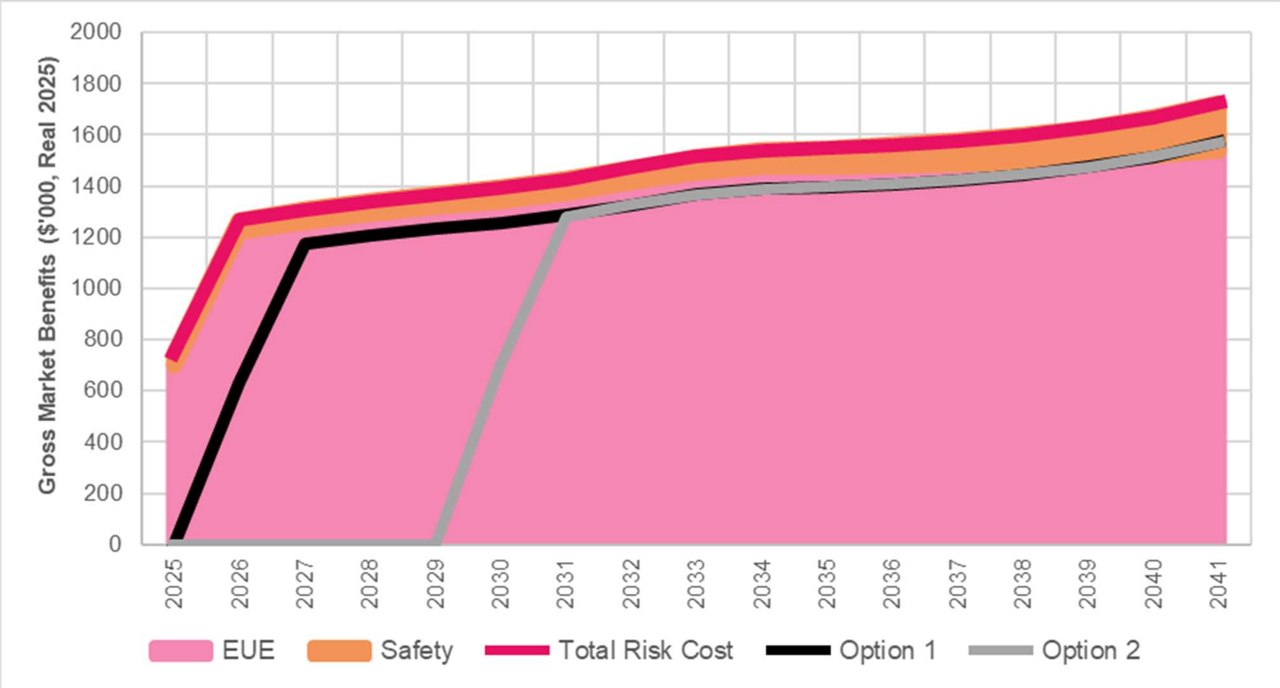

Figure 6: Gross Market Benefits: Central Scenario ($'000, Real 2025)

8.2 Net Market Benefits

Table 27 summarises the net market benefit in present value terms for each credible option over a 25-year analysis period, relative to the base case (Do Nothing). The net market benefit for Option 1 and Option 2 is the present value of gross market benefits, under the Weighted Scenario (as set out in Table 25 and Table 26 respectively), minus the present value of total investment costs of each option (as set out in Table 22).

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 27: Net Market Benefits of Credible Options for the Weighted Scenario

Options	Present Value ('000, Real 2025)			
	Investment Cost	**Gross Market Benefits**	**Net Market Benefits**	**Ranking Under RIT-D**
Do Nothing	0	0	0	2
Option 1	16,478	21,455	4,977	1
Option 2	27,524	17,253	(10,271)	3

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

8.3 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 24. Table 28 shows the results of these sensitivity studies.

Table 28: Present Net Market Benefits of Credible Options - Sensitivities ($'000, Real 2025)

Sensitivity for Central Scenario	Option 1	Option 2
All Variables: Base value	5,112	(10,165)
Maximum demand: Lower bound	3,155	(11,714)
Maximum demand: Upper bound	6,091	(9,390)
Capital and operational costs: Lower bound	10,057	(1,578)
Capital and operational costs: Upper bound	167	(14,679)
Value of customer reliability: Lower bound	1,197	(13,264)
Value of customer reliability: Upper bound	9,026	(7,066)
Discount rate: Lower bound	11,827	(5,103)
Discount rate: Upper bound	584	(6,384)
Asset failure rates: Lower bound	1,873	(12,769)
Asset failure rates: Upper bound	8,350	(7,561)

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

Table 29 presents the net market benefits in NPV terms for each option across all reasonable scenarios considered.

Table 29: Present Value of Net Market Benefits of Credible Options - Scenarios ($'000, Real 2025)

Scenario	Do Nothing		Option 1		Option 2	
	Net Market Benefit	**Ranking**	**Net Market Benefit**	**Ranking**	**Net Market Benefit**	**Ranking**
Weighted	0	2	4,977	1	(10,271)	3
Central	0	2	5,112	1	(10,165)	3
Low	0	2	210	1	(14,086)	3
High	0	2	9,476	1	(6,670)	3

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 28 and the scenario results in Table 29, demonstrates that Option 1 maximises the present value of net market benefits under all reasonable sensitivities and scenarios considered.

The proposed preferred option for investment for the CW supply area is therefore Option 1 which is to replace the existing CW switchboard, switchgear and secondary systems in the same substation building. This option satisfies the requirements of the RIT-D.

8.4 Economic Timing

The previous Sections 8.2 and 8.3 demonstrate Option 1 - Replace existing CW switchboard, switchgear and secondary systems in the same building, to be the proposed 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 avoided EUE and safety risk cost (i.e., the annualised cost of the total avoided risk) exceeds the annualised cost of the preferred option (i.e., the annualised investment cost).

Table 30 shows the expected timing of the preferred option under each reasonable scenario.

Table 30: Expected Timing of the Preferred Option

Scenario	Annualised cost of total risk minus investment costs ('000, Real 2025)					Optimum Timing[21]
	2025	2026	2027	2028	2029	
Weighted	(17)	502	543	574	602	2025/26
Central	(12)	510	551	583	611	2025/26
Low	(183)	217	248	272	294	2025/26
High	140	771	820	858	892	2024/25

Under the Weighted Scenario, the optimum timing is identified as 2025/26. Considering the two-year lead time for implementing this option, the optimum timing of Option 1 is 2026/27 (i.e., prior to November 2026).

9. Proposed Preferred Option

Section 8 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 proposed preferred option for investment is therefore Option 1. This option involves a renewal of CW's secondary systems and the 11 kV switchboard and switchgear in the existing substation building, built to CitiPower's latest design standards.

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 proposed 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 proposed preferred option is no later than November 2026.

The proposed preferred option has a total capital cost of $17.06 million (Real, 2025).

[21] The economic analysis concludes the optimum timing is 2025/26 however the preferred option cannot be constructed within this timeframe. Instead it can be constructed before the 2026/27 summer.

10. Next Steps

This DPAR represents the second stage of the RIT-D process.

In accordance with the provisions set out in clause 5.17.4, paragraph (m) of the NER, Registered Participants or interested parties may, within 6 weeks after the publication of this report, provide submissions on the draft conclusions made by CitiPower in this report.

Accordingly, Registered Participants and interested parties who wish to provide submissions on the recommendations outlined in this report must do so by 8 August 2025. Any parties wishing to make a submission should send their submission to CitiPower at ritdenquiries@citipower.com.au.

Submissions will be reviewed following the closure date.

The total capital cost of the proposed preferred option to address the identified need, is less than the trigger threshold of $28 million[22] for the publication of a separate Final Project Assessment Report (FPAR). Therefore the preferred option will be confirmed in our 2025 Distribution Annual Planning Report (DAPR), expected to be published in December 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.

[22] 2024 cost thresholds review for the regulatory investment test | Australian Energy Regulator (AER).

11. Checklist of Compliance with NER Clauses

This Section 11 sets out a compliance checklist which demonstrates the compliance of this DPAR with the requirements of clause 5.17.4, paragraph (j) of the NER in Table 31.

Table 31: 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 4.2
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(j)(3)	Summary of, and commentary on, the submissions on the options non-network options report	Not Applicable
5.17.4(j)(4)	A description of each credible option assessed	Section 6
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 8.1
5.17.4(j)(6)	A quantification of each applicable cost for each credible option, including breakdown of operating and capital expenditure	Section 7.3
5.17.4(j)(7)	A detailed description of methodologies used in quantifying each class of cost and market benefit	Section 7.1
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 7.2
5.17.4(j)(9)	The results of a net present value analysis for each option and accompanying explanatory statements regarding the results	Section 8.2 Section 8.3
5.17.4(j)(10)	The identification of the proposed preferred option	Section 9
5.17.4(j)(11)	Details of the proposed 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 proposed preferred option satisfies the RIT-D, if the proposed preferred option is for reliability corrective action and that option has a proponent and the name of the proponent.	Section 9
5.17.4(j)(12)	Contact details for a suitably qualified staff member of the RIT-D proponent to whom queries on the draft report may be directed.	Section 10

Appendix A: CW Site Photos

Figure 7: Existing 1960’s Email J Series Indoor Metal Clad Switchboard

Figure 8: Existing 1960’s Electromechanical Protection and Control Relays and Secondary Asset Panels