FINAL Decision Powercor Contingent Project

Installation of Rapid Earth Fault Current Limiters (REFCLs) – tranche three

January 2020

Inquiries about this publication should be addressed to:

Australian Energy Regulator
GPO Box 520
Melbourne Vic 3001

Tel: 1300 585165

Email: AERInquiry@aer.gov.au
AER Reference: 61920

Contents

Shortened forms

Shortened form	Extended form
ACR	Automatic Circuit Recloser
AER	Australian Energy Regulator
ART	Ararat Zone Substation
BAU	Business as usual
BMP	Bushfire Mitigation Plan
BMR	Electricity Safety (Bushfire Mitigation) Regulations 2013
capex	Capital expenditure
C-I-C	Commercial in confidence [redacted]
CRO	Corio Zone Substation
DELWP	Department of Environment, Land, Water and Planning
DNSP	Distribution Network Service Provider
EDPR	Electricity distribution price review
ESCV	Essential Services Commission (VIC)
ESV	Energy Safe Victoria
GFN	Ground Fault Neutraliser
HTN	Hamilton Zone Substation
HV	High voltage
KLN	Proposed Kalkallo North Zone Substation
KRT	Koroit Zone Substation
LTIC	Long term interests of consumers
MBN	Merbein Zone Substation
Minister	Victorian Minister for Energy, Environment and Climate Change

opex	Operating expenditure
REFCL	Rapid Earth Fault Current Limiter
RIN	Regulatory Information Notice
RIS	Regulatory Impact Statement
SLE	Sale Zone Substation
SCADA	Supervisory Control and Data Acquisition
STL	Stawell Zone Substation
STPIS	Service Target Performance Incentive Scheme
TRG	Terang Zone Substation
VEDC	Victorian Electricity Distribution Code
WPD	Waurn Ponds Zone Substation
ZSS	Zone Substation

About this decision:

Unless specifically identified, we quote all monetary quantities in 2015 dollars for the following reasons:

- This contingent project application was lodged as a part of the current 2016-20 distribution revenue determination, which was made in reference to 2015 dollars. Hence, Powercor's application was submitted using real 2015 dollars.
- To enable readers to compare our decision against the Regulatory Impact Statement for REFCL.

The only exceptions where we provide dollar value in current date nominal dollars in this decision is in references to the Post Tax Revenue Model (PTRM) as per the National Electricity Rules.

Overview

On 22 August 2019 Powercor submitted a contingent project application to the Australian Energy Regulator (AER) seeking an adjustment to its revenue allowance for tranche three of the REFCL program in accordance with the Electricity Safety (Bushfire Mitigation) Regulations 2013 (BMR). It sought an additional capital expenditure (capex) of $164.5 million[1] ($real, 2015). Powercor did not seek approval for operating expenditure (opex). Of the expenditure, $76.9 million capex is for the current 2016-20 regulatory control period and $87.6 million is for the 2021-26 regulatory control period.

While Waurn Ponds Zone Substation is a part of the tranche three works under the BMR, Powercor elected not to seek funding approval under the contingent project provision. It will be seeking funding for installation of REFCL at Waurn Ponds under the 2021-26 Electricity Distribution Price Review (EDPR) process, because of the complexity of this zone substation.[2]

Under the National Electricity Rules there is provision for approval and treatment of contingent project capital expenditure that extends into the immediately following regulatory control period.[3]

The adjustments sought by Powercor to its 2016-20 revenue determination under the contingent project provisions of the NER would not impact on network tariffs in this (2016-20) period. Any adjustments to its existing determination for higher capex for this program will only impact tariffs in the next (2021-26) regulatory period, beginning on 1 July 2021.

We have determined that the prudent and efficient cost for achieving the tranche three REFCL works is:

- $116.2 million capital expenditure in total, of which $62.8 million to be spent during the current 2016-20 period. The remaining $53.5 million to be spent in the 2021-26 regulatory control period. As noted, both these amounts impact network tariffs in the next period.
- The funding for REFCL installation at Corio Zone Substation should be considered under the 2021-26 EDPR process because Powercor has not examined all viable options to ensure that consumers do not pay more than necessary under the REFCL program.

The key differences between our decision and that of Powercor's proposal are:

(1) Deferral of Corio zone substation ($27.3m); and

(2) reducing the following cost elements to a prudent and efficient level ($20.9m in total):

- Surge arrestors replacement labour content
- HV Regulators modification labour content
- Design and procurement labour content

1 Powercor, *Contingent Project Application, REFCL program, tranche three*, 22 August 2019, p. 52.

2 Powercor, *Contingent Project Application, REFCL program, tranche three*, 22 August 2019, p. 15.

3 National Electricity Rules 6.5.7 (f)-(j)

- The need for a spare ground fault neutraliser (GFN)
- Plant hire cost
- SCADA protection and control and communications cost
- Works associated with Terang (TRG) zone substation

Other aspects of its proposal relating to the tranche three works, to install REFCLs and other related capital works, meet the prudency and efficiency criteria of the National Electricity Rules under which this proposal has been assessed.

Due to the time extension to our review, the adjustment to Powercor's 2020 regulatory revenue as the result of the tranche three REFCL program will be implemented as part of the 2021 pricing process instead of the 2020 pricing process.[4]

Both Powercor and AusNet Services applied for funding of their respective tranches one and two works. We made decisions on the tranche one application on 21 August 2017 and tranche two on 31 August 2018. We made a decision on AusNet Services' tranche three application on 3 October 2019.

This tranche three application by Powercor

On 22 August 2019 Powercor submitted a contingent project application to the Australian Energy Regulator (AER) seeking an adjustment to its revenue allowance for the installation of REFCLs as required by the *Electricity Safety (Bushfire Mitigation) Regulations 2013* (BMR).

The application seeks to recover projected capital expenditure of $164.5 million[5] for tranche three of the REFCL installation program with $76.9 million in the current (2016-20) regulatory period. The proposed expenditure for tranche three is for:

- installation of REFCL devices at seven zone substations
- replacement of equipment in the 22kV distribution network that is incompatible with REFCL operation
- other costs associated with the REFCL tranche three implementation
- management of risks associated with HV customer works to ensure the mandated timetable for REFCL implementation can be met.

Contingent project trigger event

Our distribution determination for Powercor's 2016-2020 regulatory control period included a trigger for 'Bushfire Mitigation Contingent Project 3 (tranche three of REFCL deployment) once the amended BMR came into effect. To be eligible to seek approval of the funding for

[4] Powercor submitted its application for this expenditure on 22 August 2019. On review we identified that the issues involved in assessing the application were complex and required further consideration. For this reason we extended the time limit to make our decision to 13 January 2020.

[5] Powercor: *Contingent Project Application, REFCL program, tranche three*, 22 August 2019, p.52.

the contingent project, Powercor is required to demonstrate the specified trigger event has occurred.

As set out in section 3.1, we consider that the requirements that comprise this trigger event have been satisfied.

Extension of time

Powercor submitted its application for this expenditure on 22 August 2019. On review we identified that the issues involved in assessing the application were difficult and complex and required further consideration. Accordingly, we issued a notice to Powercor on 24 September 2019[6] advising that the AER would extend the time limit to make this decision to 13 January 2020.[7]

Assessment approach

We detail our assessment approach in section 2. In summary, in reaching our decision we relied on the following information:[8]

- Powercor's application
- submissions received from stakeholders
- Powercor's responses to our questions and related comments
- our own analysis
- advice and assistance of Energy Safe Victoria (ESV) and the Essential Services Commission of Victoria (ESCV)
- relevant Victorian Government publications
- the revised Victorian Electricity Distribution Code effective 20 August 2018
- regulatory information including RIN data.

AER determination

Under the National Electricity Rules there is provision for approval and treatment of contingent project capital expenditure that extends into the immediately following regulatory control period.[9] However, there is no equivalent provision for operating expenditure.

In accordance with clause 6.6A.2 of the NER, and taking into account stakeholder comments (see section 1.7), our determination is:

- $116.2 million capital expenditure in total, of which $62.8 million to be spent during the current 2016-20 period. This is a reduction of 29 per cent on Powercor's proposal, noting

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6 AER, *Letter to Powercor NER Extension of time limit under clause 6.6A.2(j)*, 24 September 2019.

7 In accordance with the time limit extension provision of NER clause 6.6A.2(j).

8 See: https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/contingent-projects/ausnet-services-contingent-project-installation-of-rapid-earth-fault-current-limiters-tranche-3

9 National Electricity Rules 6.5.7 (f)-(j)

that certain aspects of proposed expenditure should be considered in the 2021-26 EDPR process.

We consider that:

- the project as described is consistent with the contingent project approved in the 2016-20 distribution determination
- the trigger event specified for this project has occurred
- the capital amount sought exceeds the contingency project threshold specified in rule 6.6A.1(b)(2)(iii)
- an adjusted allowance for works to integrate modified HV customer installations with its networks should be provided
- the total capital expenditure reasonably required to complete the project is $116.2 million, a reduction of 29 per cent on Powercor's proposal.
- the project has commenced and the likely completion date is 1 May 2023.

In making our determinations we consider the National Electricity Objective, which is to promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers (LTIC) of electricity with respect to price, quality, safety, reliability, and security of supply of electricity; and the reliability, safety and security of the national electricity system.

However, the AER has no power to separately assess whether the requirements under the Electricity Safety (Bushfire Mitigation) Regulations (BMR) satisfy the NEO. This is a matter for the jurisdiction.

This decision is made under the National Electricity Rules (NER). The NER requires that we must provide adequate funding to enable distributors to comply with all applicable regulatory obligations.[10] This will enable the REFCL program to be appropriately funded to meet the mandated bushfire mitigation objectives of the Victorian Government, as set out in legislation and regulations. These are designed to reduce the risk of fire starts from falling or damaged assets.

The allowance we approve in this decision will enable Powercor to meet its obligations under these legislative provisions, while also ensuring the costs incurred are prudent and efficient to ensure that consumers do not pay more than necessary for the implementation of the REFCL program.

In accordance with clause 6.6A.2 of the NER, and taking into account stakeholder comments, our determination is that the bushfire mitigation tranche three contingent project should be approved, subject to adjustments to the capital expenditure amounts as specified. This will lead to a small increase in required revenues to be recovered from customers from 1 July 2021 of about $11 per customer per year.

[10] Under clauses 6.5.6(a) and 6.5.7(a).

Structure of this document

This document sets out our determination on the timing and amount of capital and incremental operating expenditure reasonably required within the current regulatory period to undertake this contingent project.

The decision is structured as follows:

- section one provides background, introduces the application and sets out our consultation process
- section two sets out our assessment approach
- section three sets out our assessment of Powercor's application
- section four sets out our calculation of the annual revenue requirement
- section five sets out our determination.

1 Introduction

This section sets out the relevant background information to our determination. It covers whether the contingent project trigger has been met and how Powercor's revenue allowance should be amended to meet its legal and licence obligations. To arrive at our determination on the application we took into account information provided by Powercor and public submissions received on the application.

1.1 What is a contingent project

Contingent projects are significant network augmentation projects that may arise during a regulatory control period but the need and or timing is uncertain at the time when we make a distribution determination. While the expenditures for such projects do not form part of our assessment of the total forecast capital expenditure that we approve in a determination, the cost of the projects may ultimately be recovered from customers if:

- pre-defined conditions (trigger events) are met, where these project specific conditions are specified in the service providers' revenue determination
- the service provider submits an application for a contingent project, and we are satisfied that the pre-defined triggers have been meet
- we are satisfied that the proposed project is consistent with the contingent project specified in our revenue determination.
- We are satisfied the costs meet the expenditure criteria of being prudent and efficient to meet the expenditure objectives

1.2 Our role in this process

The Australian Energy Regulator (AER) is the economic regulator for electricity transmission and distribution services in the National Electricity Market (NEM) including Victoria.[11] Our electricity-related powers and functions are set out in the National Electricity Law (NEL) and National Electricity Rules (NER).

When we receive a contingent project application we publish the application and seek public comment. We assess the application to determine whether it contains the information required by the NER.[12] We examine evidence provided to determine if the mandatory pre-defined trigger event has occurred. We also examine whether the project outlined in the application is consistent with the contingent project approved in the distribution determination. We analyse the application to determine if the costs proposed represent a reasonable forecast of the capital and incremental operating expenditure required for the purpose of undertaking the contingent project, both overall and in each year remaining in the regulatory control period. If we are not satisfied that this is the case, we must determine a

[11] In addition to regulating NEM transmission and distribution, we also monitor the wholesale electricity and gas markets to ensure suppliers comply with the legislation and rules, taking enforcement action where necessary, and regulated retail energy markets in Queensland, New South Wales, the ACT, South Australia and Tasmania (electricity only) under the National Energy Retail Law.

[12] NER, clause 6.6A.2(b)(3).

substitute forecast. Where we have departed from the business' application we apply our adjustments to the post-tax revenue model to calculate the revenue the business may charge customers for the remainder of the regulatory period.

1.3 Powercor

Powercor is one of five DNSPs in Victoria and is responsible for providing electricity distribution services in the Western suburbs of Melbourne, the Geelong region and Western Victoria. We regulate the revenues Powercor and other electricity DNSPs can recover from their customers through determinations that cover the span of a regulatory control period. Powercor's current distribution determination is for the 2016–2020 regulatory control period.

We note that the tranche three works is expected to be completed in the forthcoming (2021-26) regulatory control period. The NER allows for treatment of forecast capital expenditure approved in the contingent project process where projects are expected to be completed in the immediately following control period.[13]

1.4 Other regulators—Energy Safe Victoria (ESV) and the Essential Services Commission of Victoria (ESCV)

ESV is the independent technical regulator responsible for electricity, gas and pipeline safety in Victoria. This includes administration of the *Electricity Safety Act 1998* (VIC) and the *Electricity Safety (Bushfire Mitigation) Regulations 2013* (VIC). Distribution and transmission network service providers are required to submit a bushfire mitigation plan to the ESV for approval before 1 July of each year regarding powerlines identified as 'at risk' of starting fires. Businesses required to upgrade their network to comply with the new bushfire mitigation provisions must also submit annual compliance reports to the ESV regarding their progress.

The ESCV licenses energy retailers and DNSPs to operate in Victoria and administers the Victorian Electricity Distribution Code (VEDC) that all electricity DNSPs must abide by as a condition of their distribution licence. The VEDC includes provisions on quality and reliability of supply.

1.5 Bushfire mitigation reforms

In the wake of the events of 2009's Black Saturday, the Victorian Bushfires Royal Commission (VBRC) published 67 recommendations[14] all of which were subsequently accepted by the Victorian State Government.

On 1 May 2016, the Victorian Parliament passed legislation to implement a number of the recommendations of the VBRC in the form of amendments to the *Electrical Safety (Bushfire Mitigation) Regulations 2013*.[15] The amendments introduced new technical obligations on three Victorian DNSPs that operate in high risk bushfire areas. These obligations include:

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13 National Electricity Rules 6.5.7 (f) - (j)

14 VBRC, *Final Report* (summary), July 2010. http://www.royalcommission.vic.gov.au/finaldocuments/summary/PF/VBRC_Summary_PF.pdf

15 *Electricity Safety (Bushfire Mitigation) Amendment Regulations 2016* (VIC), http://www.legislation.vic.gov.au/Domino/Web_Notes/LDMS/PubStatbook.nsf/93eb987ebadd283dca256e92000e4069/9CC083A75311B617CA257FA100148082/$FILE/16-032sra%20authorised.pdf

- each polyphase electric line originating from a selected zone substation must have the "*required capacity*" specified in the BMR
- testing for the required capacity must be undertaken before the specified bushfire risk period each year and a report detailing the results of testing submitted to ESV
- each new or replaced line with a nominal voltage from 1 kV to 22 kV inclusive must be covered or undergrounded from 1 May 2016 in 33 prescribed electric line construction areas
- each Single Wire Earth Return (SWER) line must have an Automatic Circuit Recloser (ACR) installed by 1 May 2023.

Further, Schedule 2 of the legislation defines 45 *selected zone substations* and assigns a point value to each one based on the level of bushfire risk. Victorian DNSPs must meet the *required capacity* obligations for *selected zone substations* totalling:

- at least 30 points by 1 May 2019[16]
- at least 55 points by 1 May 2021[17]
- any remaining *selected zone substations* by 1 May 2023.

The *required capacity* for a polyphase line originating from a *selected zone substation* is defined by the legislation as:

> *'…in the event of a phase-to-ground fault on a polyphase electric line, the ability—*
>
> *(a) to reduce the voltage on the faulted conductor in relation to the station earth when measured at the corresponding zone substation for high impedance faults to 250 volts within 2 seconds; and*
>
> *(b) to reduce the voltage on the faulted conductor in relation to the station earth when measured at the corresponding zone substation for low impedance faults to—*
>
> *(i) 1900 volts within 85 milliseconds; and*
>
> *(ii) 750 volts within 500 milliseconds; and*
>
> *(iii) 250 volts within 2 seconds; and*
>
> *(c) during diagnostic tests for high impedance faults, to limit—*
>
> *(i) fault current to 0.5 amps or less; and*
>
> *(ii) the thermal energy on the electric line to a maximum I^2t value of 0.10*[18]

[16] Alternatively, DNSPs must meet this obligation for all *selected zone substations* if less than 30 points of a DNSP's substations are defined in Schedule 2.

[17] Alternatively, DNSPs must meet this obligation for all *selected zone substations* if less than 55 points of a DNSP's substations are defined in Schedule 2.

[18] *Electricity Safety (Bushfire Mitigation) Regulations 2013* (VIC), Definitions.

In addition, increased compliance incentives were introduced on 11 May 2017 when the Victorian Parliament passed the *Electricity Safety Amendment (Bushfire Mitigation Civil Penalties Scheme) Act 2017*. The Act introduced civil penalty provisions for the new requirements on DNSPs, including a single fine for individual contraventions and additional fines for each day the contravention remains unresolved.

Installation of REFCLs

The BMR specifies a “required capacity” that the Victorian DNSPs are obligated to meet. REFCLs are the only available technology to meet these requirements. The required capacity is mandated by the *Electricity Safety (Bushfire Mitigation) Regulations 2013* (BMR),[19] distributors’ safety management plans and other obligations imposed by Victorian safety legislation

REFCL means “Rapid Earth Fault Current Limiter”. This device can detect single phase-to-earth faults almost instantaneously. It then cancels the voltage on the faulted line within milliseconds of detecting it and limits the voltage of the fault to below the point where it can start a fire (the active protection mode).[20]

During the period when REFCL is in active protection mode, the phase to ground voltage of the two remaining phases will be increased by 73 per cent above the normal level. Hence, some of the older equipment which was not rated to operate at these higher voltage levels will need replacing to ensure the safety of the distribution system.

The increase in voltage may also cause damage to the equipment of customers with a high voltage connection.

The key component of REFCLs is called Ground Fault Neutralisers (GFNs). REFCLs are distinguished by the addition of residual current compensation and advanced control technology to a GFN which underpins the high performance REFCL. References to GFN technology in this discussion are generally interchangeable with REFCL technology, unless the context specifies otherwise.

Implementation of the REFCL program

Under the BMR, the ‘required capacity’, which can only be met by the installation of REFCLs, must be implemented in three tranches:

- Tranche one–to complete the installation of REFCLs in 16 zone substations (8 in AusNet Services area and 8 in Powercor area) and make them operational by May 2019.
- Tranche two–to complete the installation of REFCLs in 15 zone substations (9 in AusNet Services area and 6 in Powercor area) and make them operational by May 2021.

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[19] *Electricity Safety (Bushfire Mitigation) Regulations 2013 (Vic)* was amended in 2016 by the *Electricity Safety (Bushfire Mitigation) Amendment Regulations, 2016*.

[20] REFCL cannot provide protection if more than one conductor falls on the ground simultaneously or if a second “cross-country” fault occurs, remote from the first.

A cross-country fault can result when the REFCL is limiting the voltage and current when a line falls to ground. If other assets on the network are not hardened a second fault on one of the healthy phases can occur when an asset fails which can be distant from the original line to ground fault. REFCLs can only handle one fault at a time. In this situation two high current faults can co-exist.

- Tranche three–to complete the installation of REFCLs in 14 zone substations (5 in AusNet Services area, 8 in Powercor area and 1 in Jemena area) and make them operational by May 2023.

1.6 Electricity Safety (Bushfire Mitigation) Amendment Regulations 2016 - Regulatory Impact Statement

On 17 November 2015, a Regulatory Impact Statement (RIS) on the *Electricity Safety (Bushfire Mitigation) Amendment Regulations* was released by the Victorian Department of Economic Development, Jobs, Transport and Resources.[21]

The RIS identified that the proposed regulations would impact Powercor and AusNet Services significantly (as the operators of the vast majority of rural powerlines in Victoria), with Jemena impacted to a much smaller degree. Its analysis was based on installation of a REFCL device at each of the 45 selected zone substations.

The RIS acknowledged that some equipment belonging to HV customers directly connected to the 22kV network may need to be replaced as a consequence of REFCL installation at the zone substation. The RIS stated that these costs would be incurred by HV customers. However, in tranche one of the bushfire mitigation contingent project, we found that the effect of the VEDC as it operated at the time was to require the DNSPs to incur this cost.

1.7 Previous AER decisions relating to this application

In Powercor's 2016-2020 distribution determination we included funding for REFCL installation trials at Woodend and Gisborne zone substations.[22] Powercor was obligated to undertake these trials, which formed part of its Bushfire Mitigation Plan (BMP)[23].

In the 2016-2020 distribution determination for Powercor, trigger events were defined for three successive bushfire mitigation contingent projects during the 2016-2020 regulatory period.[24] These contingent projects are specifically for expenses incurred to comply with Victorian bushfire regulations that prescribe the installation of REFCLs and associated works.

1.7.1 REFCL contingent project tranche one

On 28 March 2017, Powercor submitted an application to us seeking a determination for funding for a contingent project to be approved, and its maximum allowed revenue to be adjusted in accordance with the NER, to enable it to install REFCLs at designated zone substations for tranche one of the project, as specified by the BMR. The REFCL installations identified in tranche one must be operational by 1 May 2019.

The tranche one application sought to recover project costs of $95.4 million. This included $5.7 million for operating expenditure, and capital to cover the cost of installing REFCLs at

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21 See: https://www.energy.vic.gov.au/safety-and-emergencies/powerline-bushfire-safety-program/electrical-safety-bushfire-mitigation-further-amendment-regulations-2016

22 AER, *Final decision, Powercor distribution determination 2016-20, Attachment 6 – Capital Expenditure*, p. 134.

23 Bushfire Mitigation Plans are separate obligations regulated by Energy Safe Victoria.

24 AER, *Final decision, Powercor distribution determination 2016-20, Attachment 6 – Capital Expenditure,* p. 144.

zone substations, replacing equipment in the 22kV distribution network that is incompatible with REFCL operation, and installing isolation transformers to protect HV customers' equipment from damage from increased voltages occurring during REFCL operation.

Our final decision released on 21 August 2017, approved Powercor's application for contingent project funding with modifications to the amounts sought in its application. In particular, it provided for $85.2 million in total for tranche one of the project. Taking into account the forecast capital and operating expenditures for the project, it specified a total smoothed annual revenue requirement covering the whole Powercor network of $3.196 billion.

1.7.2 REFCL contingency project tranche two

On 20 April 2018, Powercor Services submitted an application to us seeking a determination for funding for a contingent project to be approved, and its maximum allowed revenue to be adjusted in accordance with the NER, to enable it to install REFCLs at designated zone substations for tranche two of the REFCL program, as specified by the BMR. The REFCL installations identified in tranche two must be operating by 1 May 2021.

The tranche two application:

- forecast capital expenditure of $127.7 million, representing a 7.9% increase on our approved total capital expenditure in its 2016-2020 distribution determination for Powercor
- forecast incremental operating expenditure of $5.8 million reduced to $4.8 representing 0.4% increase on the same distribution determination
- included costs to isolate or harden customer installations to operate safely with REFCL devices in operation

Our final decision released on 31 August 2018, approved Powercor's application for contingent project funding with modifications to the amounts sought. In particular, it provided for $110.5 million in total, of capital expenditure and $4.8 million for operating expenditure for tranche two of the project. This was a reduction of nearly 14% in capital expenditure and 17% in operating expenditure from what Powercor had proposed

Essential Services Commission voltage standards review

A significant matter for tranche one was the Victorian Government's preference that in complying with the BMR, costs to protect HV customer networks during REFCL operation should be borne by the relevant customers. However, the voltage limits specified in the VEDC made DNSPs liable for these costs, which would be passed on to all their customers. Consequently, the ESCV undertook a review of the voltage standards in the VEDC to address this inconsistency. The review was completed and the revised VEDC came into effect on 20 August 2018. This review has a direct effect on the allowances we have determined for tranches two and three.

REFCLs are designed to trigger when an abnormal scenario occurs on a network. For example, when a powerline of a 3-phase network falls and comes into contact with the ground, REFCLs operate to rapidly reduce the potential of an electrical spark igniting a fire by redirecting the power from the fallen line to the remaining lines. In doing so it increases the voltage levels of the other two phases of the powerline exceeding the allowable level specified by the version of the VEDC prior to the August 2018 amendment.

To accommodate the voltage variations stemming from REFCL activity, the ESCV has amended the VEDC to allow for voltage variations during REFCL operation in relevant parts of the electricity distribution networks.

The revised VEDC:

- introduces voltage variation limits that apply when REFCLs operate for bushfire risk mitigation
- introduces new obligations for DNSPs to annually publish information on planned REFCL installations
- clarifies the liability of affected parties during REFCL operation, including DNSPs and high voltage (HV) customers
- introduces new definitions to support REFCL operation.

One of the consequences of allowing higher voltages during REFCL operation is that HV customers will need to adopt measures to protect their equipment from high voltage events.

During the ESCV's consultation we provided a submission supporting the proposed changes to voltage standards to the minimum extent necessary to deal with overvoltage events caused by REFCL operation mandated under the BMR. We welcomed the requirement for HV customers to modify their networks to suit REFCL operation, and the removal of phase-to-earth voltage limits when a REFCL is operating. We also supported proposed changes to address customer information, reporting and monitoring requirements.

1.8 This Powercor tranche three application

On 22 August 2019, Powercor submitted a contingent project application for funding to install REFCLs at seven zone substations and associated works.

The expenditure required to install REFCLs was not included in Powercor's revenue allowance for the 2016–2020 regulatory control period. Instead, the AER's final decision specified the installation of REFCLs as three consecutive contingent projects (i.e. a project whereby capital expenditure is probable in the regulatory control period, but either the cost, or the timing of the expenditure is uncertain).

Powercor has split its programme of REFCL installations across its 22 named zone substations into three tranches. These tranches align with the three dates provided in the new bushfire legislation by which a certain proportion of the named zone substations must meet the required capacity for phase to ground faults (see section 1.4 above). The third tranche, which is the subject of this contingent project application, is for works to be completed and operating by 1 May 2023.

We published the application for public consultation on 28 August 2019.

We identified that the issues involved appeared difficult or complex. Accordingly, we issued a notice to Powercor on 24 September 2019 advising that we would extend the time limit to make this decision by 13 January 2020.

Powercor's contingent project application sought revenue requirement for the 2016-2020 regulatory period as shown in Table 1.1.

Table 1.1: Contingent project revenue requirement, 2016-20 ($m, nominal)

Powercor	2016	2017	2018	2019	2020	Total
Return on capital	0.00	0.05	0.05	0.05	1.40	1.56
Return of capital (Regulatory depreciation)	0.00	0.00	0.00	0.00	0.36	0.37
Operating expenditure	0.00	0.00	0.00	0.00	0.01	0.01
Net tax allowance	0.00	-0.03	-0.03	-0.03	-0.05	-0.14
Annual revenue requirement (unsmoothed)	0.00	0.02	0.02	0.02	1.73	1.80
Annual revenue requirement (smoothed)	0.00	0.00	0.00	0.00	1.81	1.81

Source: Powercor, *Contingent project application, REFCL program (tranche three),* 22 August 2019, table 6.13, p. 52.

The contingent project for tranche three relates to REFCL installation works at the following zone substations:

- Ararat (ART)
- Corio (CRO)
- Hamilton (HTN)
- Koroit (KRT)
- Merbein (MBN)
- Stawell (STL)
- Terang (TRG)

The proposed total capital expenditure is $76.9 million in the current regulatory period for the seven REFCL projects. Powercor sought to amend its previously approved expenditure and revenue requirements to levels as shown in Table 1.2.

While Waurn Ponds Zone Substation is a part of the tranche three works under the BMR, Powercor elected not to seek funding approval under the contingent project provision. It will be seeking funding for installation of REFCL at Waurn Ponds under the 2021-25 Electricity

Distribution Price Review (EDPR) process, because of complexities of the works required in this zone substation.[25]

Table 1.2 Proposed revenue requirement, after adding in the tranche three works ($m, nominal)

	2016	2017	2018	2019	2020	Total
Return on capital	201.9	215.4	232.0	249.8	267.7	1,166.9
Regulatory depreciation	109.6	98.4	109.6	126.0	132.3	575.8
Operating expenditure	232.5	244.2	260.6	269.7	282.1	1,289.2
Revenue adjustments	4.3	-2.7	3.4	11.5	0.7	17.0
Net tax allowance	38.0	34.0	31.8	34.9	34.7	173.4
Annual revenue requirement (unsmoothed)	586.3	589.3	637.5	691.8	717.5	3,222.3
Annual expected revenue (smoothed)	621.8	606.4	625.6	659.6	699.8	3,213.2
X-factor	7.80%	4.68%	-0.81%	-3.02%	-3.66%	n/a

Source: Powercor, *Contingent project application, REFCL program (tranche three),* REFCL01_MOD.02 - Amended PTRM, 22 August 2019.

1.9 Our consultation process

For the purpose of seeking public comment, our practise is to publish applications for a contingent project as soon as practicable after they have been received. Submissions received are considered by us before we make a decision on the application.[26]

1.9.1 Submissions

We received two written submissions from Ms Jill Porter and from the Victorian Minister for Energy, Environment and Climate Change. Stakeholder views and our responses are summarised below.

Ms Jill Porter

Ms Porter questioned the efficacy of REFCL technology in preventing fire starts and expressed concerns that providing funding for the REFCL program is not prudent and efficient, given that:[27]

25 Powercor, *Contingent Project Application, REFCL program, tranche three*, 22 August 2019, p.15.

26 NER, clauses 6.6A.2(c) and (d) also apply.

27 Jill Porter, *Submission to AER Powercor contingent project tranche three,* 27 September 2019.

- REFCL would not have prevented some types of fires caused by powerlines
- reported implementation issues when implementing tranche one installations
- the potential for greater risk and harm to rural communities from REFCL operations via cross country faults.[28]

AER response

The Victorian Government in its *Electricity Safety (Bushfire Mitigation) Regulations 2013* (BMR) mandated a “required capacity” for reduction in fault current in single phase faults and for this to be implemented through a rolling program of works that needs to be completed by 2023 – Tranche one works are to be completed in 2019, tranche two in 2021 and tranche three in 2023. At present the only way to achieve this is by installing a REFCL.[29, 30] Consequently, we do not have the power to prescribe or approve funding for another technology or reject this technology selection, noting that REFCLs are the only available technology that can comply with the requirements of the BMR. The NER prescribes that we must approve an efficient level of funding for Powercor to meet the regulatory requirements set out in the BMR.[31] The AER cannot separately assess whether the requirements under the BMR satisfy the NEO. This is a matter for the jurisdiction.

The allowance we approve in this decision will enable Powercor to meet its obligations under legislation; while also ensuring the costs incurred are prudent and efficient to ensure that consumers do not pay more than necessary for the implementation of the REFCL program.

There was also a concern the costs of this program have proven to be much higher than what had been forecast in the RIS in 2015. The RIS was prepared in 2015 largely based on preliminary costing information provided by the DNSPs and assessments made at the time. We have investigated the reasons for the differences between the preliminary costing and the more detailed scope of works assessments which are now available. These are supported by experience gained by both DNSPs in tranches one and two. More detail is provided in the later sections of this decision dealing with benchmarking of particular asset classes. We are satisfied that the increased volumes of work are well substantiated.

Minister for Energy, Environment and Climate Change

The Victorian Minister for Energy, Environment and Climate Change provided a submission[32] supporting the continued implementation of REFCLs under tranche three. The Minister identified the need to implement the installation program at a fair and reasonable

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28 A cross-country fault can result when the REFCL is limiting the voltage and current when a line falls to ground. If other assets on the network are not hardened a second fault on one of the healthy phases can occur when an asset fails which can be distant from the original line to ground fault. REFCLs can only handle one fault at a time. In this situation two high current faults can co-exist.

29 As acknowledged by the Powerline Bushfire Safety Taskforce (PBST) in the *Response to PBST 2011,* https://www.energy.vic.gov.au/safety-and-emergencies/powerline-bushfire-safety-program/reports-and-consultation-papers/response-to-pbst

30 See the Victorian Department of Environment, Land, Water and Planning website for further information on the Bushfire mitigation regulations, https://www.energy.vic.gov.au/safety-and-emergencies/powerline-bushfire-safety-program/electrical-safety-bushfire-mitigation-further-amendment-regulations-2016.

31 Under clauses 6.5.6(a) and 6.5.7(a).

32 Minister for Energy, Environment and Climate Change*, Powercor Tranche 3 CPA Submission to the Australian Energy Regulator,* 12 October 2019.

cost to electricity consumers, requesting us to undertake all regulatory, technical and financial due diligence to interrogate all capital and operating expenditure claims from the DNSPs.

In addition, the Minister identified several specific concerns.

1. **Powercor has not investigated its previously identified option to manage the REFCL requirements for the Corio (CRO) zone substation, the funding for this zone substation should therefore be deferred to the EDPR process**

   The Minister made the following further points:

   - *Powercor proposes $27.34 million in REFCL related expenditures for its Corio (CRO) zone substation*
   - *In May 2019 Powercor made an application to ESV for an exemption so that CRO feeders could be transferred to a proposed Bannockburn (BBN) zone substation*
   - *If approved, the BBN proposal would eliminate the need for REFCL works at CRO and Geelong*[33] *(GL) zone substations, as well as the need for any High Voltage Customer (HVC) REFCL- related works*
   - *$28 million was estimated as the cost for implementing BBN in the Tranche 2 options analysis for GL*[34]
   - *Without the BBN option's inclusion in Powercor's application, the AER cannot ensure that Powercor has considered all options or that the proposed CRO works represent a reasonable and prudent investment. It is also worth noting that the costs of REFCL works for GL, previously approved in Powercor's Tranche 2 CPA, will be obviated by implementing the BBN proposal.*
   - *In view of the uncertainty around Powercor's CRO works, those works should be excluded from consideration in Powercor's Tranche 3 CPA and deferred to the company's forthcoming Electricity Distribution Price Review (EDPR) for the 2021-25 regulatory control period. This would allow uncertainties around CRO, GL and BBN to be resolved.*

   AER response

   Having considered Powercor's proposal and noting its earlier application to ESV for an exemption, we share the same concerns as the Minister on Corio and make further comments on this matter in section 3.5.1. Our decision is to defer treatment of Corio zone substation to the EDPR when a full appraisal of all viable options can be examined; to ensure that consumers do not pay more than necessary for the implementation of the REFCL program.

2. **Large increases in drivers of capital expenditures**

   The Minister made the following points:

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[33] Geelong (GL) zone substation funding was approved in tranche two by the AER in the amount of $18.14 million. Powercor has not commenced construction of GL as it intends to resolve its GL and CRO obligations with implementation of BBN

[34] Powercor, *REFCL2.07 GL zone substation options analysis v1.0*, 23 April 2018.

Many cost elements in Powercor's Tranche 3 CPA appear to be inflated without appropriate justification. Examples of such cost elements include:

- *Civil Works - $20.82 million;*
- *Primary Plant: Supervisory Control And Data Acquisition (SCADA), Protection & Control, Communications - $14.78 million;*
- *Design and Procurement - $12.18 million;*
- *'Other' costs, including:*
  - *Primary Plant: Other Primary Materials – $4.00 million;*
  - *Contracts: Other - $3.76 million; and*
  - *Primary Plant: Other - $1.41 million.*

Key drivers of these costs are large increases in the hours of labour allocated to particular tasks, the labour rates and increased unit cost of materials.

Labour allocations. *Labour allocations have significantly increased. For example:*

- *design and procurement works have increased by 67 per cent, from 5,200 hours per zone substation (ZSS) in Tranche 2 to 8,700 hours per ZSS in Tranche 3. The total cost increased to $12 million, roughly double the $6 million cost in Powercor's Tranche 2 CPA;*
- *the $14.8 million in SCADA works proposed in Powercor's Tranche 3 CPA reflects an average cost of $2.11 million per ZSS, an increase of $1.24 million from Tranche 2 and $1.03 million from Tranche 1;*
- *Powercor allocated 5,600 hours of labour to install each Ground Fault Neutraliser (GFN) in its Tranche 3 CPA. In contrast, the average allocation for GFN installation in Powercor's Tranche 2 CPA was 1,700 hours and 1,200 hours for Tranche 1. DELWP anticipates Powercor should have some efficiency gains from its two tranches of experience in installing GFNs. The increased labour allocation results in additional costs of approximately $1 million per GFN, a total of $8 million; and*
- *the hours of live linework projected for each surge arrestor site installation has doubled, leading to a $4 million cost increase from the company's Tranche 2 CPA.*

Labour rates. *Labour rates ($/hour) have increased up to 26 per cent from its 2018 Tranche 2 CPA. Powercor has allocated up to $314 per hour for sub-testers – more than double the rates for similar work in AusNet's Tranche 3 proposal.*

Unit costs. *The unit costs of some items have increased significantly:*

- *admittance balancing units (single phase) increased by 21 per cent (though the overall cost decreased from $3.7 million in Tranche 2 to $2.6 million in Tranche 3, due to fewer units purchased despite a large unit cost increase;*
- *the unit cost of control rooms ($0.84 million each) has more than doubled from Tranche 2 ($0.40 million each) without justification; and*
- *Powercor includes $2.3 million in its cost model for indoor switch rooms at its ART and KRT substations ($1.15 million each). This represents a 32 per cent increase in unit cost for these works from Tranche 2 ($0.87 million) and is more than double the unit cost for such works in Tranche 1 ($0.49 million). There is no explanation for these works contained in either Powercor's Tranche 3 CPA or in the substation-specific attachments to its CPA.*

Total costs. *There have also been large increases in some items that were provided as a total cost, without additional details about volume or rate, in particular:*

- *civil works has increased from $4.37 million in Tranche 2 to $20.82 million. This cost appears disproportionate for a project of this type given the Department's understanding of the substation infrastructure proposed; and*
- *there is a total of $9 million in allocations for 'other', 'other primary materials', and 'other distribution materials' which are not detailed further. DELWP requests that AER investigate the nature of these costs, noting the large sums and increases from previous tranches.*

Costs including those outlined above should be closely investigated to minimise impacts on Victorian consumers and excluded from the AER's final determination.

AER response

We acknowledge the Minister's concerns. We also have concerns about some of Powercor's cost estimates. During of our review process we issued several sets of questions to Powercor covering Civil Works, Design and Procurement, Supervisory Control And Data Acquisition (SCADA), Protection & Control, Communications and "Other" cost categories.

Details of our assessment of Powercor's costing and our findings are explained in section 3.5.2. In short, we have made several adjustments to a number of these cost categories to ensure a prudent and efficient level of investment.

3. Misattributing capex as REFCL works instead of 'business as usual' expenditures

The Minister made the following points:

Only capex necessary to comply with the Electricity Safety Act 1998's 'required capacity' earth fault standards should be allowed in Powercor's Tranche 3 CPA determination.

Expenditures that have a dual purpose, both to comply with 'required capacity' but also to replace outdated equipment, augment the network or improve the network's overall efficiency, should either be excluded or not attributed entirely to REFCLs. The following cost elements raise such concerns:

- *Feeder Works: Third phase line extension - $3.98 million;*
- *Primary Plant: Control room – $3.36 million; and*
- *Primary Plant: Indoor switch room (incl. GFN enclosure and switchboard) – $2.30 million.*

***Third phase line extensions**. Powercor is seeking $4 million to extend a third phase (i.e. conductor) to its single phase (i.e. two wire) feeders to 'provide a better engineering outcome through a greater ability to switch and operate the network in a safe and reliable manner'.*

While such expenditures may be appropriate and prudent from a network planning perspective, they are not directly related to achieving compliance with 'required capacity'. The $4 million proposed for third phase extensions should be excluded.

***Control rooms.** Powercor also requests $3.4 million to construct four new control rooms at CRO, HTN, Stawell (STL) and TRG. The works at CRO and STL are proposed to replace 'ageing and asbestos-ridden building(s)' that are 'space-*

constrained'. Likewise, Powercor advises that 'the large number of aged electromechanical relays at CRO would also be replaced' in its CPA. All these works are entirely, or at least substantially, BAU capex (specifically, repex) and should be excluded. The justification for new control rooms at all four ZSSs is that the sites are space constrained. Aerial views of the sites do not support this suggestion and these costs appear to be largely BAU capex.

AER response

We acknowledge the Minister's concerns and agree with some of these points, but also make the following comments:

Third phase line extension

Subject to individual situations, third phase line extensions can be a prudent and efficient means of balancing lines to deal with the operation of REFCLs. In that sense they are not strictly addressing a BAU need. Powercor advises in its application[35] that*:*

"In limited cases, we will install the third phase of a single phase (two wire) line which provides a better engineering outcome through a greater ability to switch and operate the network in a safe and reliable manner. Through our experience with tranche one, we have found that installing the third phase is the only available option due to physical constraints at that location."

We consider that the approach is valid and that Powercor's modelling would present third phase line extensions as the optimal solution where physical constraints indicate. The tighter tolerance on network balancing required for REFCL operation was previously identified by the technical adviser to the REFCL program.[36]

Control Rooms

AER staff carried out inspections of sites at TRG, HTN, WIN, CLC, STL, ART and BAS. The comment that buildings are ageing and asbestos-ridden and reference to a large number of electromechanical relays does not necessarily mean that the works are BAU. Some control rooms are space constrained—particularly those where more extensive SCADA, protection, controls and communications are required because of replacement of the 22kV switchyard. Attempting to fit the new equipment in the old control room, particularly with live, exposed DC conductors and working around the asbestos (or removing it) would be more costly.

Similarly, although in this decision we will not consider CRO, the point Powercor is making regarding aged electromechanical relays is that if they were not disturbed, because of the REFCL installation, there would be no need to replace the old relays. However, where the existing 22kV equipment needs replacement, new protection and controls panels will be required in order to stage the transfer of feeders from the old switchgear to the new ones and to avoid accidental tripping of other 22kV feeders in the process, as well as keeping the zone substation operational. We do not consider

[35] Powercor, *Contingent project application, REFCL program (tranche three),* 22 August 2019, p. 30.

[36] Marxsen Consulting Pty Ltd, *REFCL Trial Report, Chapter 4,* 4 August 2014.

this work BAU as it is a not necessary precondition to achieving the required capacity specified in the regulations.

Also, the control rooms are specified for the four sites mentioned which have greater complexity than the other sites in tranches 1 and 2. There is not a comparable asset to benchmark against in them. Further, Powercor's estimates are supported by quotes from suppliers for building to these specifications.

4. **Inclusion of duplicative cost items:**

The Minister makes the following points:

The following cost items in Powercor's Tranche 3 CPA have previously been fully funded by the AER and should be excluded from this CPA determination:

- *a spare ground fault neutraliser (GFN) and associated costs – $3 million;*
- *HV Customer costs – $1.7 million; and*
- *a test trailer – $0.3 million.*

***Spare GFN**. Powercor seeks $3 million to acquire a spare GFN. However Powercor was previously provided funding for a spare GFN in its Tranche 2 CPA and it does not appear that a second spare GFN is a reasonable and prudent investment. The cost of the spare GFN has also increased, from $1.2 million in Tranche 2 to $3 million in Tranche 3. This increase is associated with labour costs to replace a possible future GFN fault. Since labour would only be incurred if or when a GFN fails, it is a speculative future cost that Powercor should not be able to recover via this CPA.*

***HV Customer costs.** Approximately $1 million of the $1.7 million that Powercor seeks for works related to HVCs appears unnecessary, namely the cost of 'independently verify[ing] third party reports that HV customers are appropriately hardened or able to be isolated from our network during the operation of a REFCL'.*

This independent verification is unnecessary. Powercor's proposed installation of Automatic Circuit Reclosers (ACRs) on its network would already protect it from faults caused by any HVC assets that fail during REFCL operation. Secondly, HVC works are already being reviewed by Energy Safe Victoria (ESV), DELWP and a DELWP technical advisory panel through the Government's High Voltage Customer Assistance (HCAP) and HCAP Hardship funding programs.

***Test trailers.** The $300,000 Powercor seeks for two test trailers is unnecessary and should be excluded. The company was allowed $155,000 in its Tranche 2 CPA to acquire a second test trailer, which Powercor stated was 'necessary on an ongoing basis to enable testing and commissioning of different zone substations at the same time, as well as for annual testing of the REFCLs'. Powercor has not indicated why two more testing trailers are required.*

AER responses

Spare GFN

We agree that the allowance for a spare GFN should not be funded through the contingent project process. Powercor included a spare GFN in its tranche two application and this was approved. We note this is a cost which falls in the current regulatory control period and thus seeks to add to an already funded item. We are not persuaded that Powercor has adequately demonstrated why a second spare unit is necessary.

[C-I-C][37]

[C-I-C][38]

[C-I-C]

HVC (High Voltage Customer) costs

Although we considered the Minister's submission, on this point we agree with Powercor that there is a risk of non-compliance by HV customers. HV customers do not share the obligation under the BMR. Whilst ACRs may protect the network from faults caused by non-compliance, we do not consider reliance on the operation of a safety device to be consistent with good industry practice to detect non-compliance. Therefore, we accept Powercor's argument that it requires a third party report to independently verify whether HV customers are appropriately hardened or able to be isolated from the network during the operation of the REFCL.[39] We examined the proposed allowance and consider it to be consistent with the scale and scope of the work to be undertaken in tranche three. Therefore, we consider this allowance to be prudent and efficient in terms of overall cost for the REFCL program.

Test Trailers

AER staff visited AusNet Services' Woori Yallock zone substation when it was undergoing commissioning tests. This allowed us to consider the testing requirement. At least one feeder of each zone substation is required to be tested each year for required capacity. However initial compliance testing will require testing of all feeders. Due to issues with initial testing results, all feeders have to be retested in the next annual cycle.[40] The testing requirement has been found to be more complex than anticipated. We acknowledge that there is a direct relationship between testing volume and testing equipment and that this equipment needs to be serviced regularly. We accept Powercor's case that the tranche three sites are geographically dispersed. We also accept that tranche two works are still in the commissioning stage as will tranche three works between 2020 and 2023 and testing trailers will be committed to these activities during that time. Therefore, taking these operational needs into account, we consider Powercor has justified the need for additional trailers.

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37 Powercor, *Contingent project application, REFCL program (tranche three) CONFIDENTIAL,* 22 August 2019, p. 31.

38 DELWP, Email to AER: *Powercor Tranche 3 Contingent Project Application,* 11 October 2019.

39 Powercor, *Contingent project application, REFCL program (tranche three),* 22 August 2019, p. 45.

40 ESV, Email to AER: *REFCL Testing of feeders,* 18 November 2019.

2 Assessment approach

Our assessment of the Powercor application occurs in two phases. First, we assess the application for compliance as a contingent project with NER clause 6.6A.2(b). Second, we examine the details of the proposal for compliance with the further requirements of NER clause 6.6A.2, particularly in relation to prudent and efficient costs.

We examined Powercor's tranche three application and assessed it to be compliant under clause 6.6A.2(b) of the NER.

To complete the review of the application we:

- sought further information from Powercor and examined its responses
- conducted analysis of their proposed schedule of works identified in the application.

2.1 National Electricity Rules requirement

The NER states a contingent project application must contain the following information:[41]

(i) an explanation that substantiates the occurrence of the trigger event;

(ii) a forecast of the total capital expenditure for the contingent project;

(iii) a forecast of the capital and incremental operating expenditure, for each remaining regulatory year which the Distribution Network Service Provider considers is reasonably required for the purpose of undertaking the contingent project;

(iv) how the forecast of the total capital expenditure for the contingent project meets the threshold as referred to in clause 6.6A.1(b)(2) (iii);

(v) the intended date for commencing the contingent project (which must be during the regulatory control period);

(vi) the anticipated date for completing the contingent project (which may be after the end of the regulatory control period);

(vii) an estimate of the incremental revenue which the Distribution Network Service Provider considers is likely to be required to be earned in each remaining regulatory year of the regulatory control period as a result of the contingent project being undertaken as described in subparagraph (iii);

In assessing applications we must take into account:[42]

(1) the information included in or accompanying the application;

(2) submissions received in the course of consulting on the application;

(3) such analysis as is undertaken by or for us;

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41 NER, clause 6.6A.2(b)(3).

42 NER, clause 6.6A.2(g).

(4) the expenditure that would be incurred in respect of a contingent project by an efficient and prudent Distribution Network Service Provider in the circumstances of the Distribution Network Service Provider;

(5) the actual and expected capital expenditure of the Distribution Network Service Provider for contingent projects during any preceding regulatory control periods;

(6) the extent to which the forecast capital expenditure for the contingent project is referrable to arrangements with a person other than the Distribution Network Service Provider that, in the opinion of the AER, do not reflect arm's length terms;

(7) the relative prices of operating and capital inputs in relation to the contingent project;

(8) the substitution possibilities between operating and capital expenditure in relation to the contingent project; and

(9) whether the capital and operating expenditure forecasts for the contingent project are consistent with any incentive scheme or schemes that apply to the Distribution Network Service Provider under clauses 6.5.8, 6.5.8A or 6.6.2 to 6.6.4.

In making this decision we had regard to the requirements of clause 6.6A.2(e)(1), taking into account the factors in clauses 6.6A.2(f) and 6.6A.2(g) and the additional requirements of clause 6.6A.2(h).

2.2 Our approach

To assess Powercor's application for a contingent project we followed the process set out in NER clauses 6.6A.2. Specifically we:

- verified that a project trigger event had occurred
- tested that the amount sought exceeded the threshold for a contingent project as set out in rule 6.6A.1(b)(iii)
- reviewed the application and public submissions.

We then investigated the following matters:

- differences between Powercor's estimates included in its application and the outturn costs for works undertaken in tranche one (and two) of the project (where available)
- differences between the Powercor tranche three application, and tranche one and tranche two applications, and AusNet Services' Tranche one , two and three applications
- whether the proposed implementation methods deliver a prudent and efficient outcome
- VEDC compliance
- differences between REFCL driven expenditure and reliability objectives already incentivised under the STPIS program, to ensure there is no conflict between the REFCL modifications and those achieved through reliability incentives

- differences between DNSP obligations and REFCL related statutory compliance obligations
- capex vs opex balance
- costs included in the revenue determination
- treatment of depreciation
- production of estimates
- governance.

We examined these matters and sought further information from Powercor where necessary and considered its responses. We also considered its application against the benchmark of a prudent and efficient network business.

It should be noted that although the REFCLs are a new technology and represent a significant part of the overall investment, the program of works also comprises electrical components which are widely used in providing distribution services and whose costs and operation are well known and represent existing technology. Our benchmarking activity compared the following points of reference:

- Powercor tranche one decision
- Powercor tranche two decision
- AusNet Services tranche one decision
- AusNet Services tranche two decision
- AusNet Services tranche three decision
- the RIS and
- AER benchmarks for common distribution equipment for all DNSPs in Australia.[43]

We concluded that Powercor proposed expenditure was efficient in most respects, with the key exception being in relation to the following cost elements:

- Surge arrestors replacement labour contents
- HV Regulators modification labour contents
- Design and procurement labour contents
- The need for a spare ground fault neutraliser (GFN)
- Plant hire cost
- SCADA protection and control and communications cost
- Works associated with Terang (TRG) zone substation.

[43] To benchmark particular components such as conductors, transformers, civil works and buildings, general electrical estimating skills using online and publicly available quantity surveying resources were also used.

We also considered whether a prudent and efficient network business would have structured the project in a similar way to that proposed by Powercor, and concluded they would but with some exceptions.

During the course of our assessment Powercor requested that commercially sensitive information remain confidential. We granted its request on the understanding that:

- the application makes references to supplier and technology options for GFNs. These refer to development and the state of the technology which are commercially sensitive.
- although in general, our preference is to publish all relevant information, on balance we consider that maintaining the confidentiality of the specific estimates in this project will better serve the long term interests of consumers. This approach is also consistent with our confidentiality guideline.

We sought advice from internal technical experts to assist us in making this determination. They examined how estimates were constituted and identified some weaknesses in Powercor's application which we addressed in our questions to Powercor.

Having determined the required capital expenditure necessary to complete the project, we modified the proposed post tax revenue model (PTRM) to reflect the allowances we consider appropriate. All other parameters remain unchanged.

3 AER Assessment

3.1 Trigger event

In its revised revenue application for the 2016-20 regulatory period submitted to us on 6 January 2016, Powercor proposed a three element trigger for the bushfire mitigation contingent project. In our final decision on Powercor's 2016-2020 distribution determination published 26 May 2016, we approved bushfire mitigation contingent project three as a contingent project.

The trigger event for bushfire mitigation contingent project 3 was described as follows:[44]

> *In circumstances where a new or changed regulatory obligation or requirement (within the meaning given to that term by section 2D of the National Electricity Law) ("relevant regulatory obligation or requirement") in respect of earth fault standards and/or standards for asset construction and replacement in a prescribed area of the State is imposed on Powercor during the 2016–20 regulatory control period, the trigger event in respect of bushfire mitigation contingent project 3 occurs when all of the following occur:*
>
> i. *Powercor has identified the proposed capital works forming a part of the project, which must relate to earth fault standards and/or standards for asset construction and replacement in a prescribed area of the State and which are required for complying with the relevant regulatory obligation or requirement. The proposed capital works must be listed for commencement in the 2016–20 regulatory control period in regulations or legislation, or in a project plan or bushfire mitigation plan, accepted or provisionally accepted or determined by Energy Safe Victoria;*
>
> ii. *for each of the proposed capital works forming a part of the project Powercor has completed a forecast of capital expenditure required for complying with the relevant regulatory obligation or requirement;*
>
> iii. *for each of the proposed capital works forming a part of the project that relate to earth fault standards, Powercor has completed a project scope which identifies the scope of the work and proposed costings;*
>
> iv. *The AER has made a determination under clause 6.6A.2(e)(1) of the National Electricity Rules in respect of bushfire mitigation contingent project 2.*[45]

We determined on 22 August 2019 the trigger has occurred and we had received a compliant application for consideration.

3.2 Extension of time limit

We published the application for public comment on 28 August 2019. We identified that the issues involved in assessing the application were difficult and complex and required

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[44] AER, *Final decision, Powercor distribution determination 2016 to 2020, Attachment 6 – Capital expenditure,* May 2016, p. 6–144 to 6-145.

[45] AER, *Final decision, Powercor distribution determination 2016 to 2020, Attachment 6 – Capital expenditure,* May 2016, p. 6–144 to 6-145

additional time to consider and consult. Accordingly, we issued a notice to Powercor on 24 September 2019 advising that we would extend the time limit to make this decision to 13 January 2020.[46]

3.3 Expenditure threshold

The NER stipulates the capital expenditure threshold[47] for a contingent project is the proposed capital expenditure:[48]

> *exceeds either $30 million or 5% of the value of the maximum allowed revenue for the relevant Distribution Network Service Provider for the first year of the relevant regulatory control period whichever is the larger amount*

3.3.1 AER view

The Powercor application is for $76.9 million[49] capital cost for the current 2016-20 regulatory control period, which exceeds $30 million. Also, 5% of Powercor's first year revenue is $28.7 million.[50] Hence, the capital expenditure threshold has been met.

3.4 Cost to protect high voltage (HV) customers

The BMR specify a performance regime for cutting power to a fault in a high voltage line in designated high fire risk zones in Victoria. REFCL remains the only equipment currently capable of meeting the performance requirements specified by the BMR. Therefore, Powercor needs to install and operate REFCLs on its distribution network in order to comply with the BMR.

When a REFCL is in the protection mode, the voltage of two phases of the three phase network is increased by 73 per cent. This higher than normal voltage may cause damages to HV customers' installation.

In the tranche two applications, Powercor cited the prospect that financial liability will arise for damage caused by the operation of a REFCL as grounds for funding of additional works to mitigate damage to affected HV customer networks. However, the subsequent ESCV review of voltage standards in the VEDC has resulted in a transfer of responsibility to protect HV customer networks to customers. In practice, this means customers will need to meet the costs of line hardening and installing isolation transformers.

Accordingly, Powercor modified its tranche two application to exclude the costs of HV customer isolation, though it included some other HV customer related costs, which are seen as transitional and designed to address other implementation risks for the DNSPs. These customer related works relate to installation of ACRs as well as sensors to detect potential cross-country faults[51] originating at customer premises, portable generators to support HV

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46 AER, *Extension of time limit under NER, clause 6.6A.2(j)*, 24 September 2019..

47 NER, clause 6.6A1 (b) (iii).

48 NER, clause 6.6A.2(e).

49 Powercor, *Contingent Project Application, REFCL program, tranche three*, 22 August 2019, p. 23.

50 Powercor, *Contingent Project Application, REFCL program, tranche three*, 22 August 2019, p. 23.

51 A cross-country fault can result when the REFCL is limiting the voltage and current when a line falls to ground. If other assets on the network are not hardened a second fault on one of the healthy phases can occur when an asset fails which

customer load during commissioning, and the employment of an independent consultant to verify the condition of each HV customer connection prior to REFCL operation.

Powercor has also excluded the costs of HV customer isolation in its tranche three application. However, it included some other HV customer related costs, which are seen as transitional and designed to address other implementation risks for the DNSP. These customer related works relate to installation of ACRs as well as sensors to detect potential cross-country faults originating at customer premises, and the use of an independent expert to verify the condition of each HV customer connection prior to REFCL operation.

We note that after completion of the three REFCL tranches, the cost of the abovementioned discretionary requirements for connections will be borne by the new HV customers, according to the customer connection policy which will be applied consistent with the revised VEDC.

However, in relation to existing HV customers we consider it appropriate for the DNSPs to incur these transitional commissioning interface isolation costs. In particular, DNSPs are subject to a mandated timetable (with penalties attached for failure to meet the timetable) for the roll-out of REFCLs. However, there is no equivalent obligation on existing HV customers. Therefore, there is a risk that REFCLs may not be able to be commissioned as required by the mandatory timetable if customer networks are not upgraded in time. To address this, we consider it prudent for the DNSPs to incur these relatively small transitional costs to isolate these customers should their networks not be upgraded in time for REFCL commissioning. This will avoid a delay to the roll out of REFCLs according to the timetable specified in the BMR.

3.5 Capital expenditure

3.5.1 Detailed analysis

The installation of REFCL units themselves is a small component of the overall project. Major cost drivers of the projects include:

- Hardening – where components that would fail to withstand the higher voltage conditions applied during REFCL operation are replaced
- Compatibility – where components are upgraded or modified to accommodate REFCLs in order for them to perform and for REFCLs to perform their required function
- Configuration and switching arrangements to enable the REFCL to perform reliably
- emergency and operational power supplies
- SCADA, protection and control and communications works
- civil, building and infrastructure works to accommodate the above

Our assessment of each of the cost components are explained below.

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can be distant from the original line to ground fault. REFCLs can only handle one fault at a time. In this situation two high current faults can co-exist.

Zone substation works

Powercor is required to install REFCL equipment in a number of zone substations under the BMR. Each zone substation and associated high voltage feeders present a unique capex requirement. We have considered the individual circumstances of Powercor for each of the proposed zone substations. Also, where appropriate, we compared the unit rates and volumes against external sources by seeking prices from equipment suppliers, our own consideration of likely costs and volumes for similar works elsewhere and available benchmarks for unit costs and volumes derived from our recent work reviewing the costs of other regulated DNSPs.

Corio Zone Substation

ESV advised that Powercor lodged an application on 24 May, 2019 with ESV to be exempted from the installation of REFCLs into their Geelong and Corio zone substations, and to meet its REFCL obligations by building a new Bannockburn (BBN) zone substation.

In the application, Powercor stated that the planned installation of a REFCL at the Geelong (GL) zone substation (this was part of planned tranche two works) has been delayed and the timeframe for the Terang (TRG) and Ararat (ART) zone substations accelerated to ensure that it can achieve the relevant 'points' requirement by 1 May 2021.

Powercor's proposal to the AER did not identify the use Bannockburn to remove the need for Geelong and Corio.

Both Corio and Geelong have a high level of underground networks and therefore increased capacitive loading. We understand that under the revised plan, overhead feeders in high bushfire risk areas originating from Geelong and Corio would be transferred to a new REFCL equipped Bannockburn zone substation eliminating the need for REFCLs at these two sites.

Accordingly, the AER has determined the funding for Corio should be deferred to the EDPR process after Powercor has completed its option analysis, because Powercor:

- Has already lodged an application on 24 May, 2019 with ESV to be exempted from the installation of REFCLs into their Geelong and Corio zone substations, by building a new Bannockburn (BBN) Zone Substation.
- Has delayed the planned installation of a REFCL at the Geelong (GL) pending a decision on the Bannockburn option, which could potentially save consumers about $28.6m
- Indicated that the expenditure for Corio will only commence from 2022 (on current time-frames), hence there is still time to consider a better solution.

The AER considers that approving to fund the proposed REFCL installation at Corio while knowing that there could be a better and more cost effective solution would not be in the long term interest of consumers. On the other hand, since the deferral would not affect the current intended completion date for the Geelong and Corio combined solution, Powercor is able to carefully investigate all potential options to ensure the costs are prudent and efficient.

This will mean consumers do not pay more than necessary to receive REFCL protection as intended in the legislation.

Further, the funding for Bannockburn should be the difference between the actual cost and the funding for Geelong previously approved in the tranche two application, given that Powercor has not undertaken any works at Geelong.

Other zone substation works

The following codes are used by Powercor to identify zone substations and these codes will be used in this decision:

Table 3.3: Zone substation codes

Zone substation	Code
Ararat	ART
Corio	CRO
Hamilton	HTN
Koroit	KRT
Merbein	MBN
Stawell	STL
Terang	TRG
Waurn Ponds	WPD

Powercor has proposed $60.0 million[52] for zone substation works to integrate the REFCLs including:

- the REFCL components: Ground Fault Neutraliser GFN), inverter and control room
- additional power supplies including station service transformers
- modifications to 22kV system including neutral switching bus, switchrooms AC boards, CT and VT arrangements and buswork
- battery sets and power quality meters
- capacitor bank upgrades
- spatial accommodation issues
- hardening within the zone substation

[52] Powercor, *REFCL contingent project application (tranche three), REFCL3 Expenditure cost build-up model (tranche three)*, 22 August 2019.

- civil and ground works
- associated protection and control, communications and SCADA
- PMO (Project Management Office).

The proposed works are considered below where there are substantial changes or where the driver is significant to the outcome.

Station service transformers

Station service transformers provide power to the systems and machinery that operate within a zone substation. Powercor considers that the station service transformers in sizes between 500 kVA and 750 kVA must be upgraded in order to support the additional energy requirements of the new equipment. This is because when a REFCL operates, the associated inverter injects sizeable amounts of energy to counter the faulted phase.

Based on our review of the individual site requirements, we consider that at each site, Powercor has adequately scoped the increased energy requirement of the additional equipment. We have also reviewed the proposed equipment costs. We note that the unit cost for the 500kVA size which is specified at Powercor sites in tranche three has increased by 39%. We consider that this increase is reasonable as it is based on recent supplier quotes to the specification and falls within the amount estimated in the RIS.[53]

Therefore, we consider these costs reasonably reflect the capital expenditure criteria (capex criteria) having regard to the expenditure that would be incurred in respect of a contingent project by an efficient and prudent DNSP in the circumstances of that DNSP under the NER, clause 6.6A.2(g)(4).

Underground Cables

Powercor considers replacement of all first generation cables (i.e. those manufactured prior to 1989) will deliver the best reduction in risk.[54] We have considered Powercor's and AusNet Services' approaches and compared them in the REFCL tranche three contingent project decision.[55] Powercor's tranche three underground cable replacement scope involves 8.6 km[56] of cable, half of it is associated with the Merbein (MBN) zone substation which has a large amount of old cable. This is a similar amount to the 6.9 km proposed to be replaced by AusNet Services in tranche three.[57]

Cable failures may lead to outages, leading to reduced reliability and inconvenience for customers. The consequences of a failure presents a considerable financial risk to the DNSP under the penalty scheme which applies. We therefore consider their proposed approach is prudent and efficient. It is also noted both DNSPs experienced repeated cable failures during commissioning of tranche one.

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53 ACIL Allen Consulting, *RIS Regulatory Impact Statement Bushfire Mitigations Regulations Amendment*, 17 November 2015.

54 Powercor, *REFCL contingent project application (tranche two), XPLE cable technical review.* 20 April 2018, p. 1.

55 AusNet Services, *REFCL contingent project application (tranche three),* 31 May 2019, p. 34.

56 Powercor, *REFCL contingent project application (tranche three), REFCL3_MOD01 – Expenditure build-up model (tranche three),* 22 August 2019.

57 AusNet Services, *REFCL contingent project application (tranche three),* 31 May 2019.

The performance of tranche one and tranche two underground cables under the respective DNSPs' strategies has provided guidance for further refinement and justification of the approach to identify cables requiring replacement in tranche three.

We note that the unit rate for underground cable replacement has increased since the tranche two by 36% to $425 per meter (p/m).[58] We conducted an independent analysis of the reasonable costs of undergrounding cables typical of the AusNet Services requirement. 3 core CU XPLE SWA PVC cable 120 sq mm (Copper Cross-Linked Polyethylene Steel Wire Armoured PVC cable typically used in this application) averages $285 p/m using standard estimating methods.[59] HD conduit AS 2053.2 150 mm ID averages $32.50 p/m using standard estimating methods.[60] Excavation costs average $76.50 p/m using standard estimating methods[61] assuming light soil and 10% allowance for soft and hard rock where u/g cable needs to be rerouted from old trenches. Backfilling costs include a mix of sand, 20mm crushed rock and self-levelling material average $88.70 p/m using standard estimating methods[62]. Reinstatement with a 150mm-300mm topsoil and grassing averages $12.13 p/m using standard estimating methods[63]. Traffic management/observer costs of one person full time would average $85.71 p/m using standard estimating methods[64] assuming 7m per day to lay the cable including excavation, conduit laying, cable pulling, filling and reinstatement.

The total is $580.54 ($2019) p/m. Adjusted using the Building Price index 2015: 107.45 and 2019: 116.16 yields $537.54 p/m. This compares favourably with the Powercor's estimate of $425 p/m.

It should be noted that the above cost estimates do not take into consideration:

- Access and landowner issues
- Travel and accommodation of workforce in rural areas
- Extensive rerouting underground cables due to landowner issues and modern standards requirements
- Cultural Heritage issues
- Environmental planning issues

We acknowledge that Powercor's recent experience is a valid guidance and independent data in an Australian quantity surveying reference[65] indicates that Powercor's unit rate for undergrounding is reasonable. We note further that The Regulatory Impact Statement (RIS) estimated the cost of putting polyphase powerlines underground at between $284 601 and

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58 Powercor, *REFCL contingent project application (tranche three), REFCL3_MOD01 – Expenditure build-up model (tranche three) 22 August 2019.*

59 Rawlinsons, *Australian Construction Handbook 2019,* p. 528.

60 Rawlinsons, *Australian Construction Handbook 2019,* p. 545.

61 Rawlinsons, *Australian Construction Handbook 2019,* p. 494.

62 Rawlinsons, *Australian Construction Handbook 2019,* p. 495.

63 Rawlinsons, *Australian Construction Handbook 2019,* p. 245.

64 Rawlinsons, *Australian Construction Handbook 2019,* p. 717.

65 Rawlinsons, *Australian Construction Handbook 2019.*

$706 064 per km.[66] [67] Powercor's proposed cost of $425 000 per km is within the range forecast in the RIS.

Altogether, we consider these costs reasonably reflect the capital expenditure criteria (capex criteria), having regard to the expenditure that would be incurred in respect of a contingent project by an efficient and prudent DNSP in the circumstances of that DNSP under the NER, clause 6.6A.2(g)(4).

GFNs and Arc suppression coils

The arc suppression coil unit cost is based on quotation from a single supplier. There are no other suppliers or technologies available at this time to enable Powercor to meet required capacity on its 22 kV powerlines. The cost of arc suppression coils has not changed materially since Powercor's tranche two application. Of the seven tranche three zone substations all have low capacitive loading and require only one REFCL except Hamilton (HTN) which requires two.

We consider these costs reasonably reflect the capex criteria having regard to the expenditure that would be incurred in respect of a contingent project by an efficient and prudent DNSP in the circumstances of that DNSP under the NER, clause 6.6A.2(g)(4).

Transformer neutral bus and switchboard

Powercor identified that additional switching capability beyond the scope of the RIS is required to ensure its protection system continues to operate in accordance with industry standards. The Powercor application includes a separate neutral bus and additional protection and interface control systems to address this. We consider that a neutral bus is required at all GFN zone substations. GFNs have a specific capacitive loading capacity. As load growth on a zone substation causes the capacitive loading to exceed this level, a second (and potentially a third) neutral bus is required. The neutral bus configuration is modular so one will serve a single GFN and two transformers. Two are required if a zone substation is configured with a third transformer and two 22kV buses. Each neutral bus installation requires a neutral bus controller and corresponding protection.

We note that GFNs can be paralleled and that they can be shared between transformers in a zone substation. However, an earth fault associated with a transformer needs to be cleared automatically. Otherwise a cross-country fault[68] can occur with a REFCL in operation. Further, there is a requirement to fully switch the zone substations to enable segregation. This requires a level of flexibility not currently permitted by the "banked" configuration. We therefore accept that the Powercor design is justified.

We consider these costs reasonably reflect the capex criteria having regard to the expenditure that would be incurred in respect of a contingent project by an efficient and prudent DNSP in the circumstances of that DNSP under the NER, clause 6.6A.2(g)(4).

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[66] ACIL Allen Consulting, *RIS Regulatory Impact Statement Bushfire Mitigations Regulations Amendment*, 17 November 2015.

[67] *Taskforce: Powerline Bushfire Safety Taskforce, Final Report, 30 September 2011, Table 6, escalated by CPI from March 2011 to March 2015, Powerline Replacement Fund:*

revealed by the electricity distributors through a competitive process.

[69] Powercor, *REFCL contingent project application REFCL3_MOD.01 – Expenditure build up model (tranche three),* 22 August 2019.

Control rooms

We have provided further detail on the increase in cost of control rooms at CRO, HTN, STL and TRG in section 1.9.1. The driver of the increase in this cost item is the additional space required where the entire 22kV switchyard is to be replaced in comparison to less complex sites.

The control rooms are specified for the four sites mentioned which have greater complexity than the other sites in each of the tranches so there is not a comparable asset to benchmark against. Further, Powercor's estimates are supported by quotes from suppliers for building to these specifications.

Feeder works

The unit rates for two items increased. All others remained the same as in tranche two.

ACR/gas switch control box replacement increased by 41% to $8,454[69] there is a requirement for 26 of these in tranche three so there is a $64 400 increase. The estimate is based on supplier quotes.

Admittance balancing units (single phase) increased by 21% to $17 327.[70] There is a requirement for 71 of these in tranche three so there is a $211 600 increase. This amount is based on supplier quotes and similar to AusNet Services' tranche three cost previously approved.[71]

We consider these costs reasonably reflect the capex criteria having regard to the expenditure that would be incurred in respect of a contingent project by an efficient and prudent DNSP in the circumstances of that DNSP under the NER, clause 6.6A.2(g)(4).

Line hardening

Line hardening works include the major activity of replacing surge arrestors and other items of incompatible equipment.

Surge arrestors

Powercor's unit rates have not changed for surge arrestors.

Distribution switchgear (installed)

Distribution switchgear (installed) costs have increased markedly over tranche two. The unit rate has not changed. Powercor advise that after a catastrophic failure at Colac (CLC) zone substation and other experience and testing has led to the decision to replace all ABB and F&G switchgear as well as 6% of all other distribution switchgear.[72]

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[69] Powercor, *REFCL contingent project application REFCL3_MOD.01 – Expenditure build up model (tranche three),* 22 August 2019.

[70] Powercor, *REFCL contingent project application REFCL3_MOD.01 – Expenditure build up model (tranche three),* 22 August 2019

[71] AusNet Services, *REFCL contingent project application tranche three Attachment 22 – AST Contingent Project 3 Total Cost Model – PUBLIC,* 31 May 2019.

[72] Powercor, *REFCL contingent project application (tranche three),* 22 August 2019.

We consider Powercor's proposal to replace the class of switchgear reasonable given its operational experience. We accept Powercor's proposed cost because it was based on tender results.

Victorian Electricity Distribution Code - HV customers

In its application Powercor allocated $1.9million[73] for VEDC works to integrate REFCLs.

In Section 1.5 we described:

- the treatment of HV customers in tranche one
- the changes to the VEDC as a result of a process conducted by the ESCV
- the treatment of HV customers in tranches two and three.

As outlined in section 1.5, under the revised VEDC effective from 20 August 2018, there is a transfer of risk and obligation to HV customers, which means they need to adopt a strategy at their own cost to make their systems compatible with a network with installed REFCLs.

The application argues that even though the risk and obligation has transferred to the HV customers, there are residual costs, which must be borne by Powercor to accommodate these customer works.

These costs average $78 269 which compares favourably with AusNet Services' average of $96 251 per connection.[74]

The residual costs apply to 24 customers and are intended to cover:

- installation of Automatic Circuit Reclosers (ACRs) at all HV customer sites
- installation of neutral displacement protection coordination equipment for generator HV customers
- costs for Powercor to independently verify third party reports that HV customers are appropriately hardened or able to be isolated from the network during the operation of a REFCL.

We consider there is a need for ACRs to isolate a customer where the customer's site is directly connected to the network, as would be the case where a customer chooses to harden its site. This is intended to mitigate a significant risk of a cross-country fault which Powercor would wish to detect and isolate.

We consider the requirement for ACRs to be a transitional issue relating only to existing customers. The need for ACRs is driven by uncertainty that all customer installations will be upgraded in time to allow commissioning of REFCLs in accordance with the mandated timetable. If this expenditure were not allowed, the implementation timetable for REFCL operation may be jeopardised by parties outside Powercor's control. For this reason, we consider it an acceptable inclusion in the contingent project application.

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73 Powercor, *REFCL contingent project application tranche three REFCL3_MOD.01 – Expenditure build- up model (tranche three),* 22 August 2019.

74 AusNet Services, *REFCL contingent project application Total cost model tranche three PUBLIC,* May 2019.

We also agree that:

- neutral displacement protection[75] coordination and equipment is required where HV customers have generation facilities as the existing customer equipment will not operate properly[76] when the REFCL is operating
- costs to independently verify third party reports that HV customers are appropriately hardened or able to be disconnected from the Powercor's network is an acceptable inclusion in tranche three

We consider these costs reasonably reflect the capex criteria having regard to the expenditure that would be incurred in respect of a contingent project by an efficient and prudent DNSP in the circumstances of that DNSP under the NER, clause 6.6A.2(g)(4).

3.5.2 Adjustments to the proposed capital expenditure

Our analysis has identified some program capital expenditure estimates in the contingent project application not reflective of the prudent and efficient levels. The AER has identified some areas of concern, some of which were also raised by DELWP in their submission.

These items were identified and a series of questions were put to Powercor during the review process to seek their views. Powercor was requested to respond to these questions in order to support the contingent project estimates. Our review is as follows:

Surge arrestors replacement labour content

Powercor has estimated 10-12 labour-hours per surge arrestor site[77] in tranche three. This compares with 5 hours[78] in tranche two and 4.8 hours[79] in tranche one.

The highest amount per site is 12 hours at Corio which is in an urban residential and industrial area close to a Powercor maintenance depot.

We questioned Powercor on the uplift and Powercor advised that[80] the earlier estimates did not include travel time, network operations and construction planning. Powercor also advised that the estimates were based on actuals which were not available at the time of the tranche one and two contingent project applications.

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75 Neutral displacement protection prevents a generator from islanding (continuing to operate) when the network is in a fault condition and/or disconnects.

76 Powercor, *REFCL contingent project application tranche three,* 22 August 2019, p. 29.

77 Powercor, *REFCL contingent project application tranche three REFCL3_MOD.01 Expenditure build up model, 22* August 2019.

78 Powercor, *REFCL contingent project application tranche three REFCL2_MOD.01 Expenditure build up model,* 20 April 2018.

79 Powercor, *REFCL contingent project application tranche three REFCL1_MOD.01 Expenditure build up model,* 28 March 2017.

80 Powercor, *Email to AER RE: Powercor REFCL T3 CPA Questions set 7.0*, 31 October 2019.

We benchmarked these amounts against AusNet Services which estimated [C-I-C] hours[81] for tranche one, 0.94 hours[82] for tranche two and 1.08 hours[83] for tranche three. We note that AusNet Services has included travel time, network operations and construction planning in these numbers.

We consider that the AusNet Services benchmark is appropriate.

We consider that Powercor has not justified the uplift in labour-hours per site. Our decision is to adjust the labour-hours per site to 5 hours in line with tranche one and two and on the basis that the REFCL project presents a bundle of work with a tight timeframe.

This reduces the surge arrestors component by $5.4 million.

HV regulators (close delta) modification labour content

Powercor has estimated 480 labour-hours per HV regulator upgrade[84] in tranche three. This compares with 202 labour-hours[85] in tranche two.

These amounts are similar at both Hamilton and Merbein which contain remote, rural networks and Corio which is in an urban residential and industrial area close to a Powercor maintenance depot.

We benchmarked these amounts against AusNet Services which estimated 220 hours[86] for tranche three. We note that AusNet Services has included travel time, network operations and construction planning in these numbers.

We therefore consider that distance (remoteness) from distributor's depots does not appear to be a cost driver according to the costing information provided by Powercor and AusNet Services.

We questioned Powercor on the uplift and Powercor advised that[87] the earlier estimates did not include travel time, network operations and construction planning. Powercor also advised that the estimates were based on actuals which were not available at the time of the tranche one and two contingent project applications.

We consider that the uplift is not justified on the basis that Powercor and AusNet Services benchmarks were within 10% of each other in tranche two and three respectively.

Our decision is to set the Powercor tranche three labour-hours to 220 per unit. This will reduce this forecast by $344 000.

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81 AusNet Services, *REFCL contingent project application tranche one Total Cost Model CONFIDENTIAL*, 28 March 2017.

82 AusNet Services, *REFCL contingent project application tranche two, Attachment 25 AusNet Services Total Cost Model (tranche 2)PUBLIC,* 20 April 2018.

83 AusNet Services, *REFCL contingent project application tranche three Attachment 22 AusNet Services Total Cost Model (tranche 3) PUBLIC,* 31 May 2019.

84 Powercor, *REFCL contingent project application tranche three REFCL3_MOD.01 Expenditure build up model,* 22 August 2019.

85 Powercor, *REFCL contingent project application tranche three REFCL2_MOD.01 Expenditure build up model,* 20 April 2018.

86 AusNet Services, *REFCL contingent project application tranche three Attachment 22 – AST Contingent Project 3 Total Cost Model PUBLIC,* 31 May 2019.

87 Powercor, *Email to AER RE: Powercor REFCL T3 CPA Questions set 7.0*, 31 October 2019.

GFN Labour

Powercor has estimated a range of between 3893 labour-hours at Hamilton to 8740 labour-hours at Terang per GFN in tranche three.[88] This compares with 1600 hours[89] in tranche two and 1200 hours[90] in tranche one. In addition to the $1.159 million cost of the plant, the labour-hours total adds $0.8-$1.7 million to each installation

These amounts are similar at zone substations which contain remote rural networks and Corio which is in an urban residential and industrial area close to a Powercor maintenance depot.

We benchmarked these amounts against AusNet Services which estimated a total cost of [C-I-C] million[91] consisting of materials cost of $1.093 million for the ARC Suppression Coil (GFN), [C-I-C] for contracts – construction, [C-I-C] for other total direct and [C-I-C] for Arc Suppression Coil footing for tranche three which includes all labour with the plant prefabricated and installed by contractors. We note that AusNet Services has included travel time, network operations and construction planning in these numbers. Our assessment is that AusNet Services' GFN labour-hours is substantially less than 1600 hours per site.

We questioned Powercor on the uplift and Powercor advised that[92] the earlier estimates did not include travel costs, deployment in new control rooms and site specific costs. Powercor also advised that the estimates were based on actuals which were not available at the time of the tranche one and two contingent project applications.

We consider that the uplift is unjustified and our decision is to limit the labour-hours per GFN to 1600 in line with the tranche two amount.

This will reduce the forecast for this item by $5.53 million

Spare GFN

Powercor has included a spare GFN in its tranche three contingent project application at a cost of $3 million.[93]

We approved purchase of a spare GFN in our Powercor REFCL contingent project tranche two decision.

Powercor proposes a spare GFN, associated labour and re-commissioning costs, to be used if another GFN fails. Powercor's view is that the long lead times for procurement of a GFN support holding a spare as part of Powercor's asset management strategy. Should a GFN fail during the testing and commissioning phase, or when in-service, then the spare can be utilised to ensure that Powercor meets its obligations as set out in the Amended Bushfire

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88 Powercor, *REFCL contingent project application tranche three REFCL3_MOD.01 Expenditure build up model,* 22 August 2019.

89 Powercor, *REFCL contingent project application tranche three REFCL2_MOD.01 Expenditure build up model,* 20 April 2018.

90 Powercor, *REFCL contingent project application tranche three REFCL1_MOD.01 Expenditure build up model,* 28 March 2017.

91 AusNet Services, *REFCL contingent project application tranche three Total Cost Model CONFIDENTIAL*, 31 May 2019.

92 Powercor, *Email to AER RE: Powercor REFCL T3 CPA Questions set 7.0*, 31 October 2019.

93 Powercor, *REFCL contingent project application tranche three*, 22 August 2019.

Mitigation Regulations, and are able to continue to operate the network in a safe and reliable manner. By the end of tranche three, Powercor will have 34 GFNs in operation.

[C-I-C]

The AER notes that a spare GFN was allocated in tranche two and there is insufficient justification for another spare. This money is allocated in the current regulatory control period and thus, we consider there are no grounds for an additional allocation. We further note that AusNet Services has not made application for a spare GFN in any of the three tranches.

[C-I-C].[94]

Deletion of the spare GFN and associated labour and other costs will result in a $3.05 million reduction in the application amount.

Plant Hire

Powercor's contingent project application includes allocations for plant hire at each site.

During our analysis we observed that the allocations assume plant and vehicles remain on site for the duration of the entire construction.

The contingent project application includes a considerable allocation $4.8 million[95] for the PMO (Program Management Office whose role is coordination and management of the program including optimisation of plant and vehicles). We questioned Powercor on the amounts allocated and we were provided with amounts for HTN, STS, TRG, CRO and ART zone substations.[96]

Powercor responded to follow up questions on plant hire costs. The response[97] confirmed our view that Powercor had planned to retain most of the plant on site for the duration of the project. Powercor's view is that having the plant on site mitigates risk of manual handling and falling from heights and that costs to return plant in remote locations outweighs the benefit.

Based on the responses we note an average of $338 000 expenditure on site plant hire, crane hire and additional day hire costs.

We consider that most of the construction plants, in particular lifting equipment and cranes, will not be required more than 50% of the construction period. We consider that factoring optimisation of expenditure on these items into planning and coordination by the PMO would achieve at least a 25% saving.

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94 DELWP, *Email to AER, Powercor tranche three contingent project application*, 11 October 2019.

95 Powercor, *REFCL contingent project application tranche three. REFCL3_MOD.01,* 22 August 2019.

96 Powercor, *email: Powercor REFCL CPA T3 Questions set 1.0*, 10 October 2019.

97 Powercor, *email: Powercor REFCL CPA T3 Questions set 3.0*, 22 October 2019.

We are reducing the allocation to plant hire by $84 500 per zone substation or $507 000 in total.

SCADA, protection and control and communications

We asked Powercor about line items within the classification “miscellaneous secondary materials” which includes onsite material costs and procurement and general cubicle materials. These items have the effect of uplifting the cost by an average $182 600 per site in Powercor’s response.

Powercor provided a subsequent response[98] to our follow up questions which identified several items which were already included in the miscellaneous secondary materials classification, separate to the onsite material costs and procurement and general cubicle materials items.

The level of allowance for contingency or miscellaneous items should be less than 5% at this level of detail which averages $54 300. Therefore we have adjusted to reduce the allocation by $128 300 per zone substation on HTN, STL and TRG or $385 000 in total.

Hamilton Zone Substation

In its contingent project application[99] Powercor identified Hamilton zone substation as a complex site. It requires two GFNs, a control room and due to its constrained banked formation requires replacement of the 22kV switchyard with a 22kV switchroom.

We are concerned that an options analysis was not conducted for the site. We asked several questions in relation to the redevelopment including why the area south of the 66kV switchyard was not considered in order to allow construction in an empty part of the site as in order to avoid complex interim configurations.

Powercor responded[100] that using the site south of the 66kV switchyard impacts the future expansion of the 66kV switchyard.

We agree that running cables under the 66kV switchyard would mean future development of the 66kV switchyard would require cables to be run back under the 66/22kV transformers to the site of the old 22kV switchyard. This would create unnecessary complexity. We have therefore decided to accept the proposed design.

Terang Zone Substation

In its contingent project application[101] Powercor also identified Terang zone substation as a complex site. It requires one GFN, a control room and due to its constrained banked formation requires replacement of the 22kV switchyard with a 22kV switchroom.

We are concerned that an options analysis was not conducted for the site. We asked several questions in relation to the redevelopment including why the area in the north east corner or

98 Powercor, *email: Powercor REFCL CPA T3 Questions set 1.0*, 10 October 2019.

99 Powercor, *REFCL contingent project application tranche three*, 22 August 2019, p. 38.

100 Powercor, *email to AER: Powercor REFCL CPA T3 Questions set 1.0*, 10 October 2019.

101 Powercor, *REFCL contingent project application tranche three*, 22 August 2019, p. 38.

other locations were not considered in order to avoid purchase of adjacent land and extensive expansion costs. We note that a larger 22kV switchroom with spare spaces for 22kV circuit breakers was specified to enable expansion, however, this is outside the scope of the contingent project process which does not accommodate Business as Usual (BAU) works.

We considered Powercor's responses which indicated that works to accommodate the arrangement utilising the North East corner would be complex. The proposed costs are still likely to be lower than expanding the site including the added cost involved in crossing the 66kV yard and building the 22kV yard at the opposite end of the site in the South West corner.

Powercor responded that[102] the proximity to the highway would require closures during large crane lifts and VicRoads may require Powercor to build a traffic barrier at a cost of $20 000 and that the switchroom may obstruct vision. We consider that the switchroom is well set back from the road accessing the highway and its profile is lower than a two storey building. We note further that the Princes Highway expands to four lanes, two are exit and entry lanes from roads crossing the highway. It is further noted that placing the switchroom in the north east corner enables once only undergrounding of feeder exits and much shorter conduit and cable lengths

Our decision is to reject the allocation for adjacent land. This enables savings of:

- Land $349 000
- Temporary fencing and security $141 600
- Additional conduits and cable $502 000 because long runs from north east to south west corner will not be required.
- New fencing and gates $403 300
- Removal of foundations $157 600
- Earthworks $414 000
- TRG has considerable expense associated with mobilisation/demobilisation reduce by $60 000 in line with other sites.

These total to a saving of $2.03 million. We have allowed $20 000 for a traffic barrier on the adjacent intersection as we have not adjusted for the reduced access road requirement.

Design and Procurement

Powercor's contingent project application contains high estimates of design and procurement hours for its complex sites: Hamilton 10 565 labour-hours, Stawell 10 163 labour-hours, and Terang 13 652 labour-hours.[103]

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[102] Powercor, *email to AER: Powercor REFCL CPA T3 Questions set 1.0*, 10 October 2019.

[103] Powercor, *REFCL contingent project application tranche three REFCL3_MOD.01 Expenditure build up model*, 22 August 2019.

We benchmarked these costs against similar costing information submitted by AusNet Services' tranches two and three contingent project applications and consider Powercor's cost estimates are not reflective of the prudent and efficient level of cost for similar works.

We consider with proper planning, in particular to reduce unnecessary temporary relocation of equipment (by better construction process choices) and more cost efficient layout, the cost uplift need not be as high as proposed. Also, we consider that the design and procurement work contents for Hamilton, Stawell and Terang (including alternative layout options, some of which we have suggested) are no more complex than AusNet Services' Sale Zone Substation (SLE).

We note that AusNet Services estimates for Sale Zone Substation (SLE)—which involves a new switchroom and extensive modifications—was $1.04 million.[104] We can infer an equivalent of 5200 labour-hours using Powercor hourly rates. Based on expert advice and the benchmarking against recent relevant examples we have decided to cap the design and procurement allocation to the Hamilton, Merbein, Stawell and Terang zone substations at 5500 labour-hours (equivalent to $1.1 million). This will have the impact of a reducing this forecast by $3.62 million.

[104] AusNet Services, *REFCL contingent project application tranche three, Attachment 22 – AST Contingent Project 3 Total Cost Model – PUBLIC*, 31 May 2019.

Summary

Table 3.4 – Impact of adjustments to tranche three application

Description	Reduction ($m, 2015)
Surge arrestors replacement labour content	5.40
HV Regulators (close delta) modification labour content	0.34
GFN Labour	5.53
Spare GFN	3.05
Plant hire	0.51
SCADA, protection and control and communications	0.38
Terang Zone Substation	2.03
Design and procurement	3.62
Total	**20.87**

Note: Due to rounding, numbers do not add up precisely to the total

3.6 Regulatory Depreciation

Our determination reduced Powercor's proposed capex amount by $48.3 million. This resulted in a reduction to Powercor's proposed regulatory depreciation in the current regulatory period from $0.36 million ($, nominal) to $0.34 million ($, nominal).[105]

3.7 Operating expenditure (Opex)

Powercor did not include allocation for operating expenditure in its tranche three application so we have not examined operating expenditure in this decision.

[105] Powercor, *REFCL contingent project application tranche three*, 22 August 2019, p. 7.

4 AER's calculation of the annual revenue requirement

4.1 Capital expenditure

Powercor proposed $164.5 million capital expenditure to provide for REFCL installation and supporting works for seven zone substations in tranche three of the REFCL program.[106] Powercor provided supporting evidence and detailed cost estimates to make the contingent project application.[107] These costs were not included in the 2016-2020 distribution determination given the assets were not part of the planned replacement program at that time.

We have deferred Powercor's proposed Corio Zone Substation (CRO), resulting in a $27.3 million cost saving. We also rejected $20.9 million costs as discussed in section 3.5.2.

Taking into consideration the above adjustments, we have allocated $116.2 million for capital expenditure for the tranche three works.

As discussed in the following section, to adjust the capex amounts sought by Powercor we calculated the adjustment to the inputs in the post-tax revenue model in real, 2015 dollars.

4.2 Operating expenditure

Powercor did not include an allocation for operating expenditure in its tranche three application so we have not examined operating expenditure in this decision.

4.3 Time cost of money

Rule 6.6A.2(b)(4)(iii) of the NER requires us to take into account the time cost of money based on the rate of return for the provider. In calculating the total incremental revenue, we have made an allowance for this. The time cost of money is based on the rate of return for Powercor, as set out in the 2016–20 distribution determination.[108] We have also used updated values for X-factor and return on debt in years 2 to 5 under the trailing average methodology applicable to the 2016–20 distribution determination.[109]

The smoothed revenue arising from this contingent project is then calculated by adjusting the X-factor for year 5 to maintain net present value and take account of the time cost of money. We also provide for the final year smoothed revenue to be as close as possible to the unsmoothed revenue for that year. We calculated incremental revenues of $1.46 million as result of this decision. This amount will be indexed by one year to reflect the delay in updating prices. The indexation will be based on the rate of return for Powercor set out in the 2016–20 distribution determination. The indexed amount will be passed through to the distribution network price as part of the 2021 annual pricing process.

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[106] Powercor, *REFCL contingent project application (tranche three),* 22 August 2019.

[107] Powercor, *REFCL contingent project application (tranche three), Expenditure build-up model. 22 August* 2019.

[108] AER, *Final decision, Powercor distribution determination 2016 to 2020,* May 2016.

[109] The year 5 return on debt updated value is now available and will be separately applied following this contingent project decision. This is to further revise the year 5 X-factor for the purposes of annual pricing.

4.4 Calculation of revenue requirement

Table 4.1: AER Allowance - Powercor Contingent Project Revenue Requirement, 2016-2020 ($m, nominal)[a]

	2016	2017	2018	2019	2020
Return on Capital	0.0	0.0	0.0	0.0	1.1
Return on Capital (regulatory depreciation)	0.0	0.0	0.0	0.0	0.3
Operating Expenditure	0.0	0.0	0.0	0.0	0.0
Revenue Adjustments	0.0	0.0	0.0	0.0	0.0
Net Tax Allowance	0.0	0.0	0.0	0.0	0.0
Annual revenue requirement (unsmoothed)	0.0	0.0	0.0	0.0	1.4
Expected revenue (smoothed)	**0.0**	**0.0**	**0.0**	**0.0**	**1.5**
% change to revenue	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.21%**
X-factors	7.80%	4.68%	-0.81%	-3.02%	-2.62%

a Nominal dollars are used in this section as they are directly quoted from the PTRM model as required under the NER

For this contingent project, revenue is determined by allocating the incremental capex amounts to distribution services in the post-tax revenue model. The PTRM is updated applying the same WACC parameters as were used in the determination, including the return on debt adjustment noted above.

5 AER determination

5.1 AER determination

We determined that the Powercor application for contingent project funding lodged on 22 August 2019 was approved with modifications to the amounts sought. Powercor submitted is application in real 2015 dollars. We presented calculations for incremental capital and operating expenditure in each remaining year of the regulatory control period in real 2015 dollars. This is because the PTRM calculation is expressed in real 2015 dollars.

In accordance with clause 6.6A.2(e)(1) of the NER we have determined:

- the amount of capital and incremental operating expenditure for each remaining year of the regulatory control period that we consider is reasonably required for the purpose of undertaking the contingent project in the remaining years of the current regulatory control period is as follows.[110]
- The remainder of the approved capital expenditure in the amount of $53.4 million will be spent in the 2021-25 regulatory control period.

Table 5.1 Capital and incremental operating expenditure ($m, real 2015 dollars)

	2016	2017	2018	2019	2020
Incremental capital expenditure	0.0	0.0	0.0	16.3	46.6
Incremental operating expenditure	0.0	0.0	0.00	0.00	0.00

Table 5.1 demonstrates:

- the total capital expenditure we consider is reasonably required for the purpose of undertaking the contingent project is $116.2 million (real, $2015).[111]
- the contingent project has commenced and the likely completion date is 30 April 2023.[112]

On the basis of the capital and incremental operating expenditure stated in Table 5.1, and otherwise in accordance with clause 6.6A.2(b)(4),[113] we have calculated the incremental revenue which is likely to be required by Powercor for each remaining regulatory year as a result of the contingent project being undertaken to be as follows.[114]

110 NER, clause 6.6A.2(e)(1)(i).

111 NER, clause 6.6A.2(e)(1)(ii).

112 NER, clause 6.6A.2(e)(1)(iii).

113 NER, clause 6.6A.2(e)(2).

114 NER, clause 6.6A.2(e)(1)(iv).

Table 5.2 – Incremental revenue calculation and X-factors ($m, nominal)[a]

	2016	2017	2018	2019	2020
Return on capital	0.0	0.0	0.0	0.0	1.1
Return of capital (regulatory depreciation)	0.0	0.0	0.0	0.0	0.3
Operating expenditure	0.0	0.0	0.0	0.0	0.0
Revenue adjustments	0.0	0.0	0.0	0.0	0.0
Net tax allowance	0.0	0.0	0.0	0.0	0.0
Incremental annual revenue requirement (unsmoothed)	0.0	0.0	0.0	0.0	1.4
Expected revenue (smoothed)	0.0	0.0	0.0	0.0	1.5
% change to revenue	0.00%	0.00%	0.00%	0.00%	0.21%

a Nominal dollars are used in this section as they are directly quoted from the PTRM model as required under the NER

In accordance with clause 6.6A.2(h), we have used the capital expenditure and incremental operating expenditure determined in accordance with clause 6.6A.2(e)(1)(i) to amend the PTRM to determine the effect of any resultant increase in forecast capital and operating expenditure on:

- the annual revenue requirement for each regulatory year in the remainder of the regulatory control period and
- the X-factor for each regulatory year in the remainder of the regulatory control period.[115]

We determine the effect to be as follows.

Table 5.3 – Annual revenue requirement and X-factors ($m, nominal)[a]

	2016	2017	2018	2019	2020
Annual revenue requirement (unsmoothed)	586.29	589.29	637.48	691.77	710.46
Expected revenue (smoothed)	621.77	606.45	625.56	659.60	692.77
X-factors	7.80%	4.68%	-0.81%	-3.02%	-2.62%

a Nominal dollars are used in this section as they are directly quoted from the PTRM model as required under the NER

115 NER, clause 6.6A.2(h)(3).

We have determined incremental contingent project unsmoothed revenue amount to be $1.4 million ($, nominal). This is different from the building block amount of $1.8 million ($,nominal) proposed by Powercor.[116]

We further determine the smoothed annual revenue requirement should be adjusted to $2.690 billion ($, nominal), based on the revenue requirements and X-factors set out in Table 5.3. This corresponds to a total unsmoothed annual revenue requirement of $2.690 billion ($, nominal).

We have not amended the roll-forward model.

Since this decision is made after we approved Powercor's network tariff for 2020, Powercor will begin to recover its overall cost relating to the tranche three works from its customer at about $11 per customer per year from the next (2021-26) regulatory period, beginning on 1 July 2021.

116 Powercor, *RECFL Contingent project application tranche three: REFCL3_MOD.02 – Amended PTRM,* 22 August 2019.

Appendix A - List of stakeholder submissions

Submission from	Date
Victorian Minister for Energy, Environment and Climate Change	15 October 2019
Ms Jill Porter	27 September 2019