FINAL Decision
AusNet Services Contingent Project

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

31 August 2018

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Shortened forms

Shortened form	Extended form
ACR	Automatic Current Recloser
AER	Australian Energy Regulator
BMP	Bushfire Mitigation Plan
BMR	Electricity Safety (Bushfire Mitigation) Amendment Regulations, 2016
capex	Capital expenditure
DELWP	Department of Environment, Land, Water and Planning
DNSP	Distribution Network Service Provider
ESCV	Essential Services Commission (VIC)
ESV	Energy Safe Victoria
GFN	Ground Fault Neutraliser
HV	High voltage
LTIC	Long term interests of consumers
Minister	Victorian Minister for Energy, Environment and Climate Change
opex	Operational expenditure
REFCL	Rapid Earth Fault Current Limiter
RIS	Regulatory Impact Statement
STPIS	Service Target Performance Incentive Scheme
VEDC	Victorian Electricity Distribution Code

Executive summary

On 20 April 2018 AusNet Services submitted a contingent project application to the Australian Energy Regulator (AER) seeking an adjustment to its revenue allowance for the installation of Rapid Earth Current Fault Limiters (REFCLs) in compliance with the *Electricity Safety (Bushfire Mitigation) Amendment Regulations* (BMRs) introduced by the Victorian Government. REFCLs are designed to reduce the risk of a bushfire caused by a fallen powerline.

The application seeks to recover projected capital expenditure of $139.9 million[1] for tranche two of the REFCL installation program with $134.4 million in the current (2016-20) regulatory period. The proposed expenditure for tranche two is for:

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

Since publishing our final decision for tranche one of the project, the Essential Services Commission Victoria (ESCV) completed its review of the voltage standards in the Victorian Electricity Distribution Code (VEDC). Of particular relevance to this decision, the revised VEDC that came into effect on 20 August 2018, identifies HV customers as being responsible for ensuring their electrical assets are able to withstand higher voltages occurring during REFCL operation.[2]

Our determination is that AusNet Services' revenue allowance should be amended to enable compliance with the amended BMRs. The applications were submitted before the VEDC was revised and included costs for alterations to affected HV customer networks. In recognition of the transfer of responsibility for protecting HV customer networks to the customers under the revised VEDC, we have reduced the project costs by $10.8 million for capex, and $3.4 million for opex.

AusNet Services modified its application to exclude costs of HV customer isolation. However, it included a claim for costs incurred to integrate modified customer installations with its networks. We consider this reasonable for the following reasons.

AusNet Services must roll out the REFCL installations according to a mandated timetable. 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 ensure the mandated timetable for REFCL implementation by the DNSPs is met, we consider it prudent for AusNet Services

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1 AusNet Electricity Services Pty Ltd: *Contingent Project Application, REFCL program, tranche two*, 20 April 2018, p. 5.
All dollar amounts in this document are in real, $2015 in line with the AusNet Services distribution determination unless otherwise stated.

2 ESCV: *Electricity Distribution Code version 9A*, 20 August 2018, p. 12.

to implement low cost measures to manage the risk that HV customers are not ready in time. We note AusNet Services will not incur this cost for new connections because they will be designed to comply with the new VEDC voltage standards.

Compared to AusNet Services initial application for tranche two, this change in the VEDC has contributed to reducing costs and therefore, the revenue allowance to be recovered from customers. We also have incentives in place for AusNet Services to outperform the benchmark allowances we set, including those allowed under this application.[3] Under the Capital Expenditure Sharing Scheme, if capital savings are achieved for this project, 70% of the benefit is returned to customers through reduced prices in the years following the saving.

AusNet Services also sought to recover expected operating expenditure of $4.3 million between 2018 and 2020. Our decision is that this expenditure should be reduced to adjust for the transfer of obligations to HV customers, which reduces the opex allowance to $872 000.

Our determination is that AusNet Services can recover the efficient cost of the tranche two REFCL installation project in charges during the remainder of the 2016–2020 period. The unsmoothed annual revenue requirement over the current regulatory control period will increase by $17.2 million ($nominal) to $3.159 billion ($nominal). This will increase distribution network prices on average by 1.51% in 2019 and 1.04% in 2020. In turn, this will increase residential electricity prices on average by 0.5% in 2019 (about $10 p.a.) and 0.4% (about $7 p.a.) in 2020 ($nominal).

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.

We consider this decision will serve the LTIC because it is in the LTIC that the REFCL program is properly funded to meet the mandated bushfire mitigation objectives of the Victorian Government for a safe, secure and reliable network, which also avoids fire starts from falling or damaged assets. The allowance we have provided for in this decision will enable AusNet Services to meet these objective while also ensuring the costs incurred are prudent and efficient in the LTIC.

Contingent project trigger event

Our distribution determination for AusNet Services' 2016-2020 regulatory control period included a trigger for 'Bushfire Mitigation Contingent Project 2' (tranche two of REFCL deployment) once the amended BMR came into effect. To be eligible to seek approval of the funding for the contingent project, AusNet Services 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.

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[3] AER: *Final Decision, AusNet Services distribution determination 2016 to 2020*.

Extension of time

AusNet Services submitted its application for this expenditure on 20 April 2018. 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 AusNet Services on 4 May 2018 advising that the AER would extend the time limit to make this decision to 10 September 2018.[4]

Assessment approach

We detail our assessment approach in section 2. In summary, in reaching our decision we relied on the following information:[5]

- AusNet Services' application
- submissions received from the Victorian State Government and Groundline Engineering during public consultation
- AusNet Services' responses to our questions and related comments
- our own analysis and technical expertise
- the advice and assistance of Energy Safe Victoria (ESV) and the ESCV
- our records of a workshop held by ESCV on proposed changes of the VEDC
- submissions to the revised VEDC
- the revised VEDC effective 20 August 2018.

AER determination

In accordance with clause 6.6A.2 of the NER, and taking into account stakeholder comments, our determination is that the bushfire mitigation tranche two contingent project should be approved, subject to adjustments to the capital and operating expenditure amounts as specified. 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 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

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

5 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-2

- the operational expenditure reasonably required for the purpose of undertaking the project in each year of the regulatory period is $872 000 in total
- the total capital expenditure reasonably required to complete the project is $123.5 million
- the smoothed annual revenue requirement should be adjusted to $3.156 billion total ($nominal) based on an unsmoothed annual revenue requirement of $3.159 billion ($nominal) - an increase in average distribution network prices of 1.51% in 2019 and 1.04% 2020
- the application was made using a version of our post-tax revenue model (PTRM) that included an expected inflation input from the 2016-20 distribution determination. Subsequently, on 25 May 2018, we corrected the inflation estimate and published an amended version of the PTRM. Our decision for this contingent project uses the amended version of the PTRM which incorporates the updated inflation estimate[6]
- the X-factors should be adjusted as set out in section 4 to maintain the difference in the final year revenue (2020) of not more than 3%, consistent with the AusNet Services revenue determination
- the project has commenced and the likely completion date is 1 May 2021.

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 AusNet Services' application
- section four sets out our calculation of the annual revenue requirement
- section five sets out our determination.

6 AER: *Letter to AusNet Services outlining the revocation and substitution of its distribution determination 2016-2020.*

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 AusNet Services' 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 in public submissions received on the application. Two submissions were received.

1.1 What is a contingent project

Contingent projects are significant network augmentation projects that may arise during the regulatory control period but the need and or timing is uncertain. 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 in the future 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.

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 in Victoria.[7] 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.[8] 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 revenue 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 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.

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7 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.

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

1.3 AusNet Services

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

1.4 Other regulators - Energy Safe Victoria and the Essential Services Commission (VIC)

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 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[9] all of which were subsequently accepted by the Victorian State Government.

On 1 May 2016, the Victorian Parliament acted to carry out a number of the recommendations by passing amendments to the *Electrical Safety (Bushfire Mitigation) Regulations 2013*.[10] The amendments introduced new technical obligations on three Victorian DNSPs that operate in high risk bushfire areas. These obligations include:

- 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

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

10 *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 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[11]
- at least 55 points by 1 May 2021[12]
- 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*[13]

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.

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

[11] 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.

[12] 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.

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

On 17 November 2015, a Regulatory Impact Statement (RIS) on the *Electricity Safety (Bushfire Mitigation) Amendment Regulations* (BMR) was released by the Victorian Department of Economic Development, Jobs, Transport and Resources.[14]

The RIS identified that the proposed regulations would impact AusNet Services and Powercor 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 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.

1.5.2 Previous AER decisions relating to this application

The positive pass through amount of $20.2 million ($2012) approved by the AER for AusNet Services in October 2012 included funding for REFCL trials at the Woori Yallock zone substation that had been approved by ESV.[15]

In the 2016-2020 distribution determination decision for AusNet Services, trigger events were defined for three successive bushfire mitigation contingent projects during the 2016-2020 regulatory period.[16] These contingent projects are specifically for expenses incurred to comply with Victorian bushfire regulations that prescribe the installation of REFCLs and associated works.

1.5.3 REFCL contingent project tranche one

On 31 March 2017, AusNet 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 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:

- forecast capital expenditure of $108 million ($2016), representing a 5.95% increase on our approved total capital expenditure in its 2016-2020 distribution determination for AusNet Services

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

[15] AER: *Final decision - SP AusNet pass through application,* 19 October 2012: https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/cost-pass-throughs/sp-ausnet-cost-pass-through-victorian-bushfire-royal-commission-vbrc-31-july-2012

[16] AER: *Final decision – AusNet Services distribution determination 2016-20, Attachment 6 – Capital expenditure*, p. 126, https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/ausnet-services-sp-ausnet-determination-2016-20/final-decision

- forecast incremental operating expenditure of $2.9 million, representing 0.24% increase on the same distribution determination
- proposed accelerated depreciation of $2.7 million for assets removed before the end of their economic life
- included costs incurred to maintain network reliability
- included costs to isolate or harden customer installations to operate safely with REFCL devices in operation.

Our final decision released on 21 August 2017, approved AusNet Services' application for contingent project funding with modifications to the amounts sought. In particular, it provided for $97.4 million (real, $2016) in total, of capital expenditure for tranche one of the project.

1.5.4 Essential Services Commission voltage standards review

A significant matter for tranche one was the Victorian Government 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. Consequently, the ESCV undertook a review of the voltage standards in the VEDC to address this inconsistency. The review is now complete and the revised VEDC came into effect on 20 August 2018. It has a direct effect on the allowances we have determined will apply to tranche two.

REFCLs are designed to trigger when an abnormal scenario occurs on a network. For example, when a powerline 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 in that part of the distribution system so that voltage levels may be outside the allowable range in the VEDC.

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.

A chief consequence 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.

1.6 AusNet Services' application

On 20 April 2018, AusNet Services submitted a contingent project application for funding to install REFCLs at eight zone substations and associated works.

The expenditure required to install REFCLs was not included in AusNet Services' 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).

AusNet Services 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 second tranche, which is the subject of this contingent project application, is for works to be completed and operational by 1 May 2021.

We published the application for public comment on 20 April 2018. Consultation closed on 15 June 2018. We identified that the issues involved appeared difficult or complex. Accordingly, we issued a notice to AusNet Services on 4 May 2018 advising that we would extend the time limit to make this decision by 10 September 2018.

AusNet Services' contingent project revenue requirement for the 2016-2020 regulatory period is set out in **Table 1.1.**

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

AusNet Services	2017	2018	2019	2020	Total
Return on capital	-	-	1.4	6.5	8.1
Regulatory depreciation	-	-	2.6	4.6	7.3
Operating expenditure	-	-	2.3	2.6	5.0
Revenue adjustments	-	-	-	-	-
Net tax allowance	-	-	0.5	0.7	1.1
Annual revenue requirement (unsmoothed)	-	-	6.9	14.4	21.4
Expected revenue (smoothed)	-	-	10.3	10.9	21.2

Source: AusNet Services, *Contingent project application, REFCL program (tranche two),* 20 April 2018, table 1, p.7.

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

- Bairnsdale
- Belgrave
- Eltham
- Ferntree Gully
- Lilydale
- Moe
- Ringwood North
- Wodonga 22kV

The proposed total capital expenditure is $134.4 million in the current regulatory period for the eight projects. AusNet Services sought the following expenditure and revenue requirements to deliver the contingent project, as set out in **Table 1.2.** This incorporates amendments to the original application due to subsequent changes to the VEDC.

Table 1.1 Amended revenue requirement, 2016-20 ($m, nominal)

	2016	2017	2018	2019	2020	Total
Return on capital	217.3	230.9	251.1	268.2	289.4	1,256.8
Regulatory depreciation	103.8	88.5	93.9	97.4	106.3	490.0
Operating expenditure	230.3	240.0	251.6	264.6	276.5	1,263.0
Revenue adjustments	5.3	-6.4	-3.6	16.1	0.1	11.6
Net tax allowance	33.2	27.1	27.8	29.1	28.5	145.7
Annual revenue requirement (unsmoothed)	590.0	580.2	620.6	675.5	700.7	3,167.0
Expected revenue (smoothed)	586.0	597.9	623.0	661.3	696.9	3,165.1
X-factor	8.27%	0.30%	-1.84%	-3.73%	-3.00%	n/a

Source: AusNet Services, *Contingent project application, REFCL program (tranche two), 20 April 2018*, Table 31, p. 67.

1.7 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.[17]

1.7.1 Submissions

We received two written submissions. We also met with DELWP who provided oral feedback on the Minister's submission. Stakeholder views and our responses are summarised below.

Groundline Engineering

Groundline Engineering (GE) questioned the use of REFCLs suggesting they are expensive and will introduce problems into the grid, being incompatible with grid infrastructure. It suggested these problems will require further expenditure to manage. GE suggested other technologies are preferable, including covered conductors, stand-alone power supplies as well as the replacement of existing aged infrastructure. It suggested the legislative instrument mandating REFCLs is flawed because it relies on outdated information, and that the AER should consider the use of other technologies which are safer and more cost effective.

[17] NER, clauses 6.6A.2(c) and (d) also apply.

The Victorian Government in its Bushfire Mitigation Regulations (BMR) mandated a "required capacity" for reduction in fault current in single phase faults. At present the only way to achieve this is by installing a REFCL.[18,19] Our role as the economic regulator is to ensure a prudent and efficient implementation of the REFCL technology as specified in the BMR.

We note the points raised in GE's submission, including suggestions for alternative technologies to reduce bushfire risk. We also note that a number of these, including covered conductor technology, replacement of aging infrastructure and vegetation management have already been adopted by the distribution businesses in response to the VBRC. However, the requirement to install REFCLs is set out in Victorian Government legislation and was seen as an important additional safeguard. As such, this is a regulatory obligation on AusNet Services for the purposes of the NER. Consequently, we do not have the power to substitute an alternative technology that does not comply with the requirements of the BMR.

Victorian Minister for Energy, Environment and Climate Change

The Victorian Minister for Energy, Environment and Climate Change provided a submission supporting the continued implementation of REFCLs under tranche two. The Minister identified the need to implement the installation program at a fair and reasonable 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. The Minister also requested us to take into account the ESCV's revisions to the voltage standards in the VEDC in coming to our decision.

In addition, the Minister identified a number of specific concerns, three of which are relevant to AusNet Services, and our response is as follows:

1. whether DFA costs were a valid project cost and if so, to ensure the costs for upgrades to the DFA system claimed by AusNet Services are only recovered once

   We note that AusNet Services' investment in DFA is funded by rewards available under the Service Target Performance Incentive Scheme (STPIS) for improving reliability. It is not funded from providing regulated services. Our investigation of this issue concluded that the installation of REFCLs will reduce customer reliability during the peak bushfire season, notably on Total Fire Ban days. Further, in periods outside the peak bushfire season, the REFCL cannot operate without the DFA scheme being modified or it will adversely affect customer reliability. This is because a REFCL operating in "reliability mode" will maintain supply into a fault that the DFA scheme cannot identify and isolate without modification.

   Moreover, AusNet Services invested in DFAs to gain a reward under the STPIS. If the DFA works were not funded, AusNet Services would suffer penalties under the STPIS that exceed the cost of the upgrade, which is not an equitable or

[18] 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

[19] 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.

efficient outcome. As the operation of the STPIS is set in a determination, it is not feasible to adjust the scheme until the next determination, due in 2020. Compared to compensating AusNet Services for the cost of upgrading the DFA system, we do not consider a direct compensation payment desirable or preferable. This is because a compensation payment would have an equal or greater impact on customer prices but reliability would be reduced compared to our preferred alternative. This would not satisfy the NEO.

As discussed in more detail below, we have examined these costs and confirmed they are site specific and consider them reasonable.

2. that volumes of the pre-emptive replacement of older underground cable are reasonable

   We note that older underground cable types are prone to failure when REFCLs are operated. The repeated operation of a REFCL damages the insulation of underground cables, and older cable types have less residual capacity to tolerate higher voltages and are prone to early failure, leading to prolonged outages that reduce reliability. We have examined the volumes proposed by AusNet Services and are satisfied they are reasonable to address asset failures caused by REFCL operation.

3. that AusNet Services' claim for costs to explore alternative technology solutions and suppliers has not been adequately justified, and should instead be addressed in the business' upcoming distribution determination rather than in this contingent project

   We note the BMR establishes particular standards which can currently only be met by REFCLs. AusNet Services has sought funds to develop alternative technologies for future use which will enable it to diversify the technologies it uses to meet the BMR.

   We are not satisfied that AusNet Services has justified this allowance. As the project is now substantially underway, any benefits of identifying an alternative supply source are likely to be minimal. Moreover, if an alternative source of supply were identified this cost could be funded from the savings achieved on the allowances granted in this decision.

2 Assessment approach

Our assessment of the AusNet Services application occurs in two phases. Firstly, we assess the application for compliance with NER clause 6.6A.2(b). Secondly, we examine the detail 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 AusNet Services tranche two application and assessed it to be compliant under clause 6.6A.2(b) of the NER.

To complete the review of the application we:

- issued questions to AusNet Services and examined its responses
- conducted analysis of sub-projects identified in the application.

2.1 National Electricity Rules requirement

The NER states a contingent project application must contain the following information:[20]

(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:[21]

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

[21] 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 AER's approach to the AusNet Services contingent project

To assess AusNet Services' 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 AusNet Services' estimates included in its application and the outturn costs for works undertaken in tranche one of the project
- differences between the AusNet Services and Powercor applications
- the technical approach proposed in the application
- 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 in correspondence with AusNet Services, sought further information 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 represent a significant part of the overall investment, it also comprises electrical components which are widely used in providing distribution services and are not new technology. Our benchmarking activity compared the following points of reference:

- AusNet Services tranche one decision
- AusNet Services tranche two application
- Powercor tranche one decision
- Powercor tranche two application
- the RIS and
- AER benchmarks for common distribution equipment for all DNSPs in Australia.[22]

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

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

- the project involves substantial new works that have yet to be put to tender, and that publishing the information will provide price signals to prospective tenderers which may lessen competitive pricing pressure
- 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.

[22] 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 sought advice from internal technical experts to assist us in making this determination. They examined how estimates were constituted and identified some weaknesses in AusNet Services' application which we addressed in our questions to AusNet Services.

Having determined the required capital and operating 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, AusNet Services proposed a three element trigger for the bushfire mitigation contingent project. In our final decision on AusNet Service's 2016-2020 revenue determination published 26 May 2016, we approved bushfire mitigation contingent project two as a contingent project.

The trigger event for bushfire mitigation contingent project was described as follows:[23]

> *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 AusNet Services during the 2016–20 regulatory control period, the trigger event in respect of bushfire mitigation contingent project 2 occurs when all of the following occur:*
>
> *i. AusNet Services 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 AusNet Services 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, AusNet Services 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 1.*

We determined on 11 May 2018 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 20 April 2018. We identified that the issues involved in assessing the application were difficult and complex and required

[23] AER: *Final decision, AusNet Services distribution determination 2016 to 2020, Attachment 6 – Capital expenditure,* May 2016, p. 6–120.

additional time to consider and consult. Accordingly, we issued a notice to AusNet Services on 4 May 2018 advising that we would extend the time limit to make this decision to 10 September 2018.[24]

3.3 Expenditure threshold

The NER currently stipulates the capital expenditure threshold[25] for a contingent project is the proposed capital expenditure:[26]

> *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 AusNet Services application is for $134.4 million, which exceeds $30 million. Also, 5% of AusNet Services' first year revenue is $29.3 million.[27] Hence, the capital expenditure threshold has been met.

3.4 Technical considerations

3.4.1 Technical standards in jurisdictional legislation

AusNet Services is required to comply with the VEDC as well as all applicable Victorian electrical safety regulations arising out of the BMR.[28] AusNet Services has also developed a revised BMP[29] which has been approved by the ESV. The BMP contains the timetable for completion of tranche two. Under Victorian electrical safety regulations, this is a further obligation which AusNet Services must fulfil.

3.4.2 AER View

In 2015, the Victorian Government introduced the BMR. 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. A REFCL remains the only equipment currently capable of meeting the performance requirements specified by the BMR. Therefore, AusNet Services needs to operate REFCLs on its distribution network in order to comply with the BMR.

AusNet Services and Powercor each applied for contingent project funding in accordance with their determinations.[30] They each have specific requirements included in their BMPs to install and operate REFCLs.

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

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

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

27 AusNet Services: *REFCL contingent project application (tranche two),* April 2018, p. 15.

28 *Electricity Safety (Bushfire Mitigation) Amendment Regulations*, 2016.

29 Bushfire Mitigation Plans (BMPs) are separate obligations regulated by Energy Safe Victoria.

30 AER: *Final decision, AusNet Services distribution determination 2016 to 2020, Attachment 6 – Capital expenditure*, May 2016, p. 6–144.

In their tranche two applications, both DNSPs 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, AusNet Services modified its 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 originating at customer premises, portable generators to support HV customer load during commissioning, and the employment of an independent consultant 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, so as not to delay the roll out of REFCLs according to the timetable specified in the BMR.

3.5 Capital expenditure

The following table summarises the AusNet Services contingent project application capital expenditure requirements.[31]

In this discussion, note REFCLs require the use of Ground Fault Neutralisers (GFNs) for the specific purpose specified by the BMR. REFCLs are distinguished by the addition of residual current compensation and advanced control technology to a GFN which creates the high performance REFCL. References to GFN technology in this discussion are generally interchangeable with REFCL technology, unless the context specifies otherwise.

[31] AusNet Services: *REFCL contingent project application (tranche two),* April 2018, p. 5.2.

Table 3.1: Summary of contingent direct project capital expenditure requirements ($m, 2015)

	2016	2017	2018	2019	2020	Total
Zone substations	-	-	7.0	39.2	11.5	57.7
Network Balancing	-	-	3.1	7.6	5.6	16.3
Line Hardening	-	-	2.7	10.1	8.8	21.5
HV customers	-	-	4.0	7.8	2.8	14.6
Compatible Equipment			1.5	8.3	10.9	20.6
Other			0.7	.8	2.1	3.7
Total	**-**	**-**	**18.9**	**73.8**	**41.8**	**134.4**

Source: AusNet Services: *REFCL contingent project application (tranche two),* April 2018, p. 52.

AusNet Services provides the following list of requirements to explain the difference between the contingent project application and the RIS in its application:[32]

- neutral bus switchboard
- REFCL backup protection and interface control systems
- testing the REFCL
- community engagement plan
- work to achieve the required performance criteria in each switching zone
- works needed to maintain balance.

[32] AusNet Service: *Contingent Project Application – tranche two, Bushfire Mitigation,* 20 April 2018, p. 39-40.

Table 3.2: Reasons for cost differences compared to Government RIS ($m, 2015)

	AusNet Services CPA 2, $2015	RIS Estimate $2015	AusNet Services RIS Submission	Primary reasons for cost differences
Ringwood North	6.3	4.5	6.8	1 GFN – Primarily due to un-costed items and additional line hardening works.
Eltham	12.4	4.6	8.2	The use of 2 GFNs is the primary driver of the price increase, as well as un-costed items and additional line hardening works.
Ferntree Gully	12.6	4.4	6.8	The use of 2 GFNs is the primary driver of the price increase, as well as un-costed items and additional line hardening works.
Wodonga 22kV	15.1	14.3	22.1	The total cost is comparable between the RIS and our application. However, similar issues with un-costed items and additional line hardening works exist at this site.
Moe	14.6	5.5	11.1	The use of 2 GFNs is the primary driver of the price increase, as well as un-costed items and additional line hardening works.
Belgrave	12.7	5	8.2	The use of 2 GFNs is the primary driver of the price increase, as well as un-costed items and additional line hardening works.
Lilydale	11.1	5.4	9.6	The use of 2 GFNs is the primary driver of the price increase, as well as un-costed items and additional line hardening works.
Average	**12.4**	**6.5**	**11.2**	

Source: AusNet Services: *REFCL contingent project application (tranche two),* April 2018, p. 39.

3.5.1 Detailed analysis

Each zone substation and associated feeders present a unique capex requirement. We have considered the individual circumstances of AusNet Services 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.

Compared to the RIS and the tranche one application, we note that the costs per site are higher than listed in the earlier documents. Our investigation has found that a substantial contributor to this is the larger size and complexity of the networks being served in this tranche. Notably, a number of sites are a mixture of peri-urban and rural locations and this adds significantly to the technical challenges for REFCL design and installation. In turn, this has led to an increase in both the complexity of the REFCL works and the consequent costs.

Zone substation works

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

Table 3.3: Zone substation codes

Zone substation	Code
Ringwood North	RWN
Eltham	ELM
Ferntree Gully	FGY
Wodonga 22kV	WOTS22
Moe	MOE
Belgrave	BGE
Lilydale	LDL
Bairnsdale	BDL

AusNet Services has proposed $57.8[33] for zone substation works to integrate the REFCLs including:

- the REFCL components: Arc Suppression Coil, Residual Current Compensator/inverter and control panel
- additional power supplies including station service transformers

[33] AusNet Service: *REFCL contingent project application (tranche two)*, 20 April 2018.

- modifications to 22kV system including neutral switching bus, AC switchboards and changeover boards
- battery sets and power quality meters
- capacitor bank upgrades
- spatial accommodation issues
- hardening within the zone substation
- civil and ground works
- associated protection and control and SCADA
- PMO and community engagement.

The proposed works are considered below.

Station service transformers

Station service transformers provide power to the systems and machinery that operate within a zone substation. AusNet Services 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, AusNet Services has adequately scoped the increased energy requirement of the additional equipment. We have also reviewed the proposed equipment costs. We consider these costs are consistent with recent cost benchmarks[34] for similar works carried out by AusNet Services and Powercor.

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

Underground cable replacement is a major departure from tranche one as has been noted by both Powercor[35] and AusNet Services[36] and DELWP in its submission[37].

Powercor and AusNet Services have each developed similar strategies for testing and targeting replacement of underground cables. AusNet Services' strategy includes an additional testing and reactive component allocated to other project costs, but achieves a common outcome to Powercor's. We consider both strategies to be appropriate. We note the

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[34] Powercor and AusNet Services RIN submissions.

[35] Powercor: *REFCL contingent project application (tranche two),* 20 April 2018.

[36] AusNet Service: *REFCL contingent project application (tranche two),* 20 April 2018.

[37] DELWP: Letter to the AER, June 2018.

Marxsen[38] report on which some of the RIS estimates were based, noted the need for testing and pre-emptive replacement of HV underground cables.

AusNet Services presented its Line Hardening Strategy[39], which presents recent experience from tranche one and other underground cable experience. The strategy considers the age and risk profile of particular cable sections. AusNet Services claimed $12.0 million for cable replacement costs in tranche two.[40]

The average cost of underground cable testing and replacement for each substation for AusNet Services in tranche two is $C-I-C million, and for Powercor $1.7 million. The difference between the two outcomes is driven by the variation in cable length and cable age, which determines the extent of testing versus immediate replacement. In addition, AusNet Services' strategy involves testing and reactive replacement which is allocated to other program costs.

We queried AusNet Services on the application of its strategy in relation to reactive and pro-active cable replacement programs, as there is an additional reactive component for AusNet Services compared with Powercor. AusNet Services responded[41] that it has a very large underground component to its network (378.2km) and that a further 11kms of its network is forecast to be replaced under its reactive program. In accordance with AusNet Services' strategy, it has to perform extensive "prycam" testing on all REFCL cables and Partial Discharge (PD) testing if indicated. If a section fails testing, it needs to be replaced. Also, some cables based on older insulation technology need replacing as experience with REFCL operation shows a high failure rate of similar cables. These cables have been found unsuitable for safe operation with REFCLs. The volumes of the cable to be replaced are derived from the AusNet Services' asset register.

The approach is consistent with good engineering practice. We consider the application is sufficiently rigorous in setting out grounds to support this approach. We accept the prediction of underground cable failures in old cables resulting from unanticipated applied voltages is difficult to determine precisely. Both Powercor and AusNet Services are adopting similar strategies. 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.

We are of the view that the performance of tranche one and tranche two underground cables under the respective DNSPs' strategies will provide guidance for further refinement of the approach to identify cables requiring replacement in tranche three.

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

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38 Marxsen: *HV customer assets and REFCL protected networks: a preliminary risk survey*, June 2017.

39 AusNet Services: *REF 20-07 REFCL Program Line Hardening Strategy Issue, Attachment 12,* 3 April 2018.

40 AusNet Service: *REFCL contingent project application (tranche two), Attachment 25 AST Total Cost Model CONFIDENTIAL Attachment 25 AST Total Cost Model CONFIDENTIAL,* 20 April 2018.

41 AusNet Services: 2018_08_8 REFCL – *Response AER question 2.0 – Cables,* August 2018.

project by an efficient and prudent DNSP in the circumstances of that DNSP under the NER, clause 6.6A.2(g)(4).

Modifications to AC boards

AusNet Services has proposed additional works associated with the AC changeover board based on the additional load requirements of the new REFCL equipment. AusNet Services' approach is broadly comparable with the Powercor approach, however AusNet Services has taken a slightly different design approach. We reviewed the proposed design to satisfy ourselves of the need for this work.

The requirement for additional works including the AC changeover board was not identified in the RIS cost estimates, however we consider that there is a technical requirement for this work, which has only become apparent after more detailed site investigations. The works associated with replacement of AC changeover boards is required because the alternating current (AC) auxiliary supply requirement dramatically increases due to the GFN installation.[42] The cost of this work will be higher than specified in the RIS at all but one zone substation because of the need for multiple GFNs at these locations.

We consider the proposed unit rates and volumes of works associated with the AC changeover boards are reasonable. They are consistent with the benchmarks and independent estimates by our internal engineering experts of the likely scope and cost of similar works. **Table 3.4** below describes tranche two sizing of GFNs.

Therefore, we consider these costs reasonably reflect 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 cost is based on quotation from a single supplier. The device is a specialised item. AusNet Services has made considerable efforts to identify alternative suppliers but none have a product that can be implemented within the tranche two mandatory timeframe. Therefore, AusNet Services has endeavoured to negotiate an appropriate supply arrangement with the sole supplier to support the contingent project. AusNet Services has endeavoured to address the inherent risks associated with a single source provider of this equipment, which plays a central role in the required works identified in section 3.6.

Table 3.4 outlines the tranche two GFN size requirements. All of the tranche two zone substations are larger, more complex and have greater amounts of underground cables than the tranche one zone substations. All but the Ringwood North zone substation require two GFNS. We have found this increase in size is a dominant factor in the increased cost of the tranche two projects compared with tranche one.

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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[42] AusNet Services: *REFCL contingent project application (tranche two),* April 2018 p. 40.

Table 3.4: Tranche two GFN sizing

Zone substation	Code	Network Capacitance (A)	GFNs required
Ringwood North	RWN	108	1
Eltham	ELM	223	2
Ferntree Gully	FGY	255	2
Belgrave	BGE	266	2
Lilydale	LDL	196	2
Moe	MOE	133	2
Bairnsdale	BDL	234	2
Wodonga 22kV	WOTS22	223	2

Source: AusNet Services: *Arc Suppression Coil Sizing Policy*, April 2018, p. 12.

Capacitor banks

Capacitive balancing is a critical technical factor ensuring a REFCL can operate as intended. This cost item was set out in the RIS and included in the AER's initial assessment[43].The per unit costs are similar to the Powercor estimate[44] and fall within the range of $0–500 000 estimated in the RIS.[45] We think it is unlikely that the standard would be significantly different between the two operators. The major reason for the difference is that the AusNet Services estimates are based on site specific data, whereas Powercor has adopted an average cost approach.

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

We queried the need for a transformer neutral isolator and neutral bus works in tranche one. After discussion with AusNet Services staff, AER technical staff accepted the requirement is justified by the changed current flows associated with REFCL operation.

AusNet Services 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 AusNet Services application includes a separate neutral bus and additional protection and interface control systems to address this. We consider that a neutral bus is

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[43] AusNet Services: *Total cost model (tranche two), CONFIDENTIAL,* April 2018.

[44] Powercor: *REF 30-04 REFCL Program - Arc Suppression Coil Sizing Policy Issue 2.*

[45] DELWP: *Regulatory Information Statement, Bushfire Mitigation Regulations Amendment, Acil Allen,* 2015*,* p. 69.

required at all GFN zone substations. A second neutral bus is required at substations with two GFNs. The reason is that 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. Each neutral bus installation requires a neutral bus controller.

We queried the requirement for neutral bus switchboards and additional circuit breakers at zone substations with a single GFN. AusNet Services advised that the zone substations are built to a 1950's design standard (referred to as "banked"), meaning that the flexibility in operation is limited. A fault within the zone substation can cause protection to operate and require manual operation to restore. AusNet Services argued that inclusion of the REFCL devices increases the operational complexity and that manual operation would be required at KLK and SMR to change operating modes resulting in customer outages. AusNet Services made a case for providing fully switched capability at single GFN zone substations on the basis that it is introducing a new standard for operation, the incremental cost of additional neutral earthing CBs is small, and the RMU approach enables modular expansion.

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 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 AusNet Services 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).

GFN Enclosures

There has been no significant increase in the cost of GFN enclosures. The unit cost of GFN enclosures[46] proposed by AusNet Services is $C-I-C for a single GFN control room, and $C-I-C and $C-I-C for a two GFN control rooms. This is similar to the amount proposed by Powercor of $144 921.[47] We acknowledge that the DNSPs have taken different approaches in the design and layout of the GFN systems, including in its selection of indoor and outdoor systems. Powercor's layout can accommodate up to three GFNs and AusNet Services' provides for single and double GFN control rooms.

AusNet Services proposes installing fifteen GFNs at eight sites costing on average $C-I-C per GFN. Powercor proposes installing ten GFNs at five sites costing on average $72 461 per GFN. We acknowledge Powercor has taken a different approach in the design and layout of the GFN systems, including selection of indoor and outdoor systems. The Powercor concept can accommodate up to three GFNs providing economies of scale, and the AusNet Services' concept provides for single GFN control rooms and double GFN control rooms.

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46 AusNet Services: *ASN Total Cost Model (tranche two), CONFIDENTIAL,* April 2018.

47 Powercor: *REFCL2_MOD.01 Expenditure build-up model (tranche two),* April 2018.

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).

Battery room upgrades

Battery room upgrades are required at two zone substations. REFCLs are integrated into a DC control system that is battery backed. When buses are split to accommodate REFCLs, the DC system must be separated and a new battery is required. In addition, REFCLs need to be battery backed so that service restoration following a zone substation 'Black' event is not jeopardised.

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).

Power quality meters

Power quality meters are required for accurate data logging of REFCL responses. As dual buses are being created to enable the flexible operation necessary to support REFCL function, duplication is required.

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).

Community engagement

The RIS did not identify community engagement as a project cost. AusNet Services has allocated funds for this purpose and capitalised them in each zone substation application. We consider this allocation reasonable on the basis that:

- it is consistent with AER's broader expectations for DNSPs to consult customers
- there may be customer impacts (outages) from the commissioning and insulation testing
- the 2009 bushfires fires caused considerable loss of life and property. There is an expectation in the community that active engagement will be maintained.

We note that DNSPs already have community engagement programs that they can leverage off. This means that the costs are incremental to existing activities and not incurred as a new/standalone activity.

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).

Feeder works

Network balancing

AusNet Services has identified costs of $16.3[48] million for this project compared with $16.9[49] million in tranche one for network balancing works to integrate REFCLs. Network balancing is a major component of feeder works. We have reviewed the network balancing unit rates and also compared these with the RIS and Powercor application.

AusNet Services' expenditure averages $2.0 million and Powercor's averages $2.3 million per zone substation. The RIS estimated network balancing would cost between $0 and $340 000[50] per zone substation based on 0 to 85 phase rotations at $4 000 per rotation per zone substation.

The AusNet Services Network Balancing Strategy[51] presents arguments for the increased costs of this activity in comparison to the RIS. In particular, the strategy identifies:

- new learning from the WYK REFCL commissioning
- that the RIS was tabled in 2015 before detailed design and site considerations were taken into account. The contingent project application was lodged in 2018
- that the RIS detailed phase rotations alone as a means of achieving balance. It was found that the level of leakage mitigation required to meet the BMR is much higher than is possible under that strategy.[52]
- a need for a combination of approaches including:
    - performing single-phase spur and distribution substation phase transpositions (i.e. where a network section may have more connections to the Red phase in comparison to the Blue phase a transposition can be made converting a Red and White connected spur or asset to the White and Blue phases)
    - installing balancing capacitor banks at the beginning of single phase spur sections
    - installing LV balancing capacitor banks on the three-phase back bone
    - in a small number of cases adding a third conductor to the beginning of a single-phase spur section (practical for cable) and converting that cabled section to three-phase.

During tranche one AER staff conducted site inspections at trial sites operated by AusNet Services and Powercor. We reviewed the arguments advanced for these additional activities against the field experience of operational staff at those locations. We consider the field experience justifies the combined approach as detailed above. We therefore consider the approach taken by AusNet Services is reasonable.

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48 AusNet Services: *Total cost model (tranche two) CONFIDENTIAL,* April 2018.

49 AusNet Services: *Total cost model (tranche one) CONFIDENTIAL,* March 2017.

50 DELWP: *Regulatory Impact Statement, Bushfire Mitigation Regulations Amendment, ACIL ALLEN Consulting,* Table 14, p. 69.

51 AusNet Services: *Attachment 10 - REF 20-06 REFCL Program Network Balancing Strategy Issue,* 2 April 2018.

52 AusNet Services: *REFCL Program Network Balancing Strategy,* April 2018.

The application outlines a detailed risk and governance strategy.[53] The AusNet Services approach is similar to the Powercor approach.[54] We consider the AusNet Services approach is in accordance with industry norms for complex capital works and is reasonable.

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

AusNet Services has requested $7.8 million[55] for line hardening works to integrate the REFCLs in tranche two, compared with $12.1 million[56] claimed in tranche one. This estimate is based on the actual surveyed population requirement. It plans to replace 32.4% of its tranche two surge arrestor population to withstand over-voltages caused by REFCLs. Overall it plans to replace 40% of its total population of surge arrestors.[57]

The RIS[58] proposed that replacement of one in three surge arrestors would reflect an appropriate cost/risk benefit profile. This analysis was based on preliminary data for age and specification of the surge arrestor population, taking into consideration statistical failure rates. Subsequent work by an independent testing laboratory, commissioned by AusNet Services identified specific makes and models of existing installed surge diverters which would require replacement.

AusNet Service and Powercor agree closely with the RIS assessment of the percentage of the surge diverter population that requires replacement. The higher percentage is based on a detailed study of GIS data augmented by line inspections in many cases. As such, we accept the AusNet Services estimate of replacement volumes.

These costs reflect surge arrestor costs previously accepted by us in the determination for AusNet Services, the tranche one contingent project application and in an earlier pass through application. On this basis, the AER accepts the additional cost per surge arrestor ($C-I-C per unit and $C-I-C per site) as proposed by AusNet Services in the contingent project application.

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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53 AusNet Services: *REFCL Program Network Balancing Strategy,* April 2018, p.11 and p. 13.

54 Powercor: *REFCL Program Network Balancing,* April 2018, p. 11 and p. 13.

55 AusNet Services: *Total cost model (tranche two) CONFIDENTIAL,* April 2018.

56 AusNet Services: *Total cost model (tranche one) CONFIDENTIAL,* March 2017.

57 AusNet Services: *ASN CPA*, p. 29.

58 DELWP: *Regulatory Impact Statement, Bushfire Mitigation Regulations Amendment,* ACIL ALLEN, 2015, p. 69.

Compatible equipment

AusNet Services has proposed $5.2 million[59] in tranche two compared with $5.5 million[60] in tranche one. Compatible equipment works to integrate the REFCLs include:

- ACR replacement and upgrades
- voltage regulator replacement and upgrades.

Compatible equipment in the AusNet Services network comprises the replacement or upgrade of ACRs and voltage regulators. AusNet Services has produced a REFCL Program Automatic Circuit Recloser Strategy.[61] The approach was to produce an options analysis from which the preferred option was to modify ACRs where possible and replace where necessary. We consider the AusNet Services options to be reasonable and the assessment to be robust, leading to a lower cost than the RIS estimate. Overall, the cost claimed per upgrade is $C-I-C, and $C-I-C per replacement, which has not changed from tranche one, and also is less than the cost specified in the RIS of $70 000.[62] AusNet Services has not allocated a cost for regulators in the tranche two program.[63]

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).

Victorian Electricity Distribution Code - HV customers

In its application AusNet Services allocated $14.6 million[64] for VEDC works to integrate REFCLs.

Section 1.5 describes:

- 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 tranche two.

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.

AusNet Services submitted responses to our questions[65] anticipating an amendment to the VEDC, which was subsequently finalised. The revised application argues that even though

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59 AusNet Services: *Total cost model (tranche two), CONFIDENTIAL,* April 2018.

60 AusNet Services: *REFCL Contingent Project Application AST Distribution Contingent Project 1 Cost Model CONFIDENTIAL*, March 2017.

61 AusNet Services: *REFCL Program Automatic Circuit Recloser Strategy* 2017.

62 AusNet Services: *REFCL Program Automatic Circuit Recloser Strategy* 2017, p. 9.

63 AusNet Services: *REFCL contingent project application,* April 2018, p. 47.

64 AusNet Services: *REFCL contingent project application Total cost model,* April 2018.

65 AusNet Services: *Response to AER question 1.0 CONFIDENTIAL,* June 2018.

the risk and obligation has transferred to the HV customers, there are residual costs, which must be borne by AusNet Services to accommodate these customer works.

AusNet Services estimates these residual costs at $4.1 million ($nominal)[66]. These costs average $150 112 per connection.

The residual costs are intended to cover:

- installation of ACRs at all HV customer sites
- protection investigation
- consultant reports to independently verify customer site installations are appropriately hardened or able to be isolated from our network during the operation of a REFCL
- backup generation to isolate customers during commissioning
- project oversight
- updating schematics for hardening.

These costs relate to 27 customer isolation substations anticipated to be installed at 18[67] sites. AusNet Services forecast that eight customers would elect to harden their installations and one would elect to convert its HV connection to an LV connection.

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 AusNet Services would wish to detect and isolate.

In regard to the treatment of existing HV customers who have indicated that they wish to have an isolation transformer installed, we agree with AusNet Services that these customers may change their strategy due to the amendment to the VEDC. Further, since the customers will now manage the implementation of their selected strategy AusNet Services does not know whether the isolation transformer will be connected close to the point of connection.

AusNet Services argues that it does not have a legal basis to charge a customer with an existing connection for an ACR as a connection alteration under its customer connection policy[68] unless the customer applies for a connection alteration. AusNet Services states that new customers who apply for an HV connection would be liable under the connection policy for an ACR where AusNet Services' determines it is necessary, as new customers must design their installation to operate with REFCLs in compliance with the recently amended VEDC.

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

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66 AusNet Services: *Response to AER question 1.0 CONFIDENTIAL revised HV customer model EDC,* June 2018.

67 AusNet Services: *REFCL contingent project application (tranche two),* April 2018.

68 AusNet Services: *Distribution Connection Policy,* 31 March 2017.

operation may be jeopardised by parties outside AusNet Services' control. For this reason, we consider it an acceptable inclusion in the contingent project application.

We also agree that:

- protection investigation is an acceptable inclusion in the tranche two project application for the reasons set out in AusNet Services' revised application.
- costs to independently verify third party reports that HV customers are appropriately hardened or able to be disconnected from the AusNet Services network is an acceptable inclusion in the tranche two project application for the reasons set out in AusNet Services' revised application
- backup generation to isolate customers during commissioning is an acceptable inclusion in the tranche two project application for the reasons set out in AusNet Services' revised application
- project oversight and updating of schematics for hardening is an acceptable inclusion in the tranche two project application for the reasons set out in the AusNet Services' revised application.

Overall, we have reduced the allowed capital expenditure for HV customers corresponding with the revised VEDC by $10.8 million. This amounts to 8.0% of the total application.

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 Other capital expenditure

AusNet Services sought $20.8 million[69] for other works to integrate the REFCLs including:

- Distribution Feeder Automation schemes compatibility
- live line equipment purchases
- survey costs
- CPA tranche two development costs
- phase identification tools and training.

Distribution Feeder Automation (DFA)

Under the NER[70], AusNet Services is required to maintain reliability. The Service Target Performances Incentive Scheme (STPIS) is the mechanism providing an incentive for maintaining reliability. However, AusNet Services must also comply with its obligations under the BMR to operate REFCLs. We consider this is a more important obligation in high fire danger periods, although it necessarily entails a reduction of reliability on the relevant days, especially where the DFA system is no longer effective.

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69 AusNet Services*: REFCL Total cost model (tranche two), CONFIDENTIAL,* April 2018.

70 NER, clause 6.5.6 and 6.5.7.

AusNet Services has allocated $15.4 million in tranche two compared with $7.9 million which was approved in tranche one to Distribution Feeder Automation (DFA).[71] AusNet Services has developed the DFA as a network self-healing system, which detects faults and automatically isolates short sections of feeders so that larger groups of customers are not affected. The increased cost in this tranche is driven by the increased volume of switchable sections available in the network. It should be noted that AusNet Services' investment in DFA is not funded from providing regulated services. It is funded by rewards available under the STPIS for improving reliability.

The integration of a REFCL into the network reduces the effectiveness of the DFA system and will cause a significant loss of reliability in some operating modes. When in operation, REFCLs reduce fault currents to a level below DFA sensing resolution capability. This means that the DFA cannot operate in the manner for which it was designed. In tranche two, AusNet Services modelled the impact on the STPIS under a range of operating conditions and estimated the annual penalty impact to be $4.5 million, leading to a $19.2 million[72] total penalty impact in the next regulatory control period. Had this penalty effect been known at the time of the last regulatory determination, an adjustment mechanism may have been incorporated in the STPIS. However, the operation of the STPIS is set as part of the determination. Consequently, it is not feasible to amend the STPIS scheme to fully address this effect until the next regulatory determination is made (in 2020). This penalty arises because the STPIS scheme operates on five years of historical performance data but lags by two years.

The Victorian Energy Minister questioned whether the costs of DFA were a valid project cost and whether the costs for modification of the DFA system were duplicated from tranche one. In relation to the question of costs, AusNet Services is under an obligation to maintain reliability even where a requirement is imposed on it to install equipment that reduces current service levels. If it fails to do so, it will receive penalties under the STPIS. We therefore consider the cost of corrective actions to counter this effect is valid. If AusNet Services did not undertake these actions it would receive a substantial penalty under the STPIS and therefore, would not receive the expected return on its investment in the DFA scheme.

The cost of DFA modifications proposed by AusNet Services to restore lost functionality includes a small amount for logic upgrades and a much larger amount for replacement of protection devices that sense faults. We discussed this proposal with AusNet Services.

In tranche one, AusNet Services advised that more sensitive current sensing arrangements were in development and estimated the cost to be approximately $C-I-C [73] per switch. The tranche two application identifies the outturn per unit cost is 1.3% higher at $C-I-C.[74] This small increase arises because detection is a new process and can only be resolved through trial and error.

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71 AusNet Services: *Attachment 15 - REF 20-13 REFCL Program Distribution Feeder Automation Strategy Issue,* 1 April 2018.

72 Email: *AusNet Services to AER $ basis of STPIS figures* 31 August 2018

73 AusNet Services*: REFCL Total cost model (tranche one), CONFIDENTIAL,* March 2017.

74 AusNet Services*: REFCL Total cost model (tranche two), CONFIDENTIAL,* April 2018.

Our investigation of this issue concluded that in periods outside the peak bushfire season, the REFCL cannot operate without the DFA scheme being modified or it will adversely affect customer reliability. This is because a REFCL operating in “reliability mode” will maintain supply into a fault that the DFA scheme cannot identify and isolate without modification. Moreover, AusNet Services invested in DFA to gain a reward under the STPIS which funds its investment in DFA. If the DFA works were not funded, AusNet Services would suffer penalties under the STPIS that exceed the cost of the upgrade, which is not an equitable or efficient outcome. However, compared to compensating AusNet Services for the cost of upgrading the DFA system, we do not consider a direct compensation payment desirable or preferable. This is because a compensation payment would have an equal or greater impact on customer prices but reliability would be reduced compared to our preferred alternative. This would not satisfy the NEO.

Where events that impact reliability result from externally imposed requirements, the STPIS includes a mechanism through exclusions to discount those effects. That mechanism is available and might be applied in relation to REFCL operation on high fire danger days. Another means to offset the penalty under the STPIS is to amend the scheme applicable to AusNet Services to adjust the rates imposed for non-performance due to REFCL installation. We do not consider this an appropriate alternative. In particular, it would permanently affect customers on REFCL served feeders, causing a decline in their service reliability. In periods outside declared fire danger days AusNet Services would be expected to operate its network to maintain reliability. As the installation and operation of a REFCL will render some elements of the DFA system ineffective, we accept that AusNet Services should be able to address this impact. In relation to the Victorian Energy Minister’s submission, we examined the costs claimed in this tranche and are satisfied they are for site specific works and have not been previously funded.

The modelled STPIS impact is greater than the cost of the proposed modifications. As such, we consider it cost-effective to allow the $15.4 million capital allowance that AusNet Services has claimed. We believe this approach is consistent with the incentives on AusNet Services under the STPIS. Further, AusNet Services will face incentives to develop a more efficient solution. If so, we expect this benefit will be accounted for in the tranche three application of the REFCL contingent project.

We consider that operation of REFCLs is expected to result in increased longer-term reliability benefits for all customers on a protected line. We note that the application does not attempt to account for these benefits as it states the operating mode of REFCLs outside peak fire danger periods has not be finalised. We consider that a prudent operator will conduct a careful appraisal of the available operating modes and the potential for reward under the STPIS, and that in the long-term, the increased reliability benefit attainable under the STPIS will be realised.

The commissioning date for REFCLs in tranche two is 1 May 2020. The current STPIS targets are fixed for the period of the regulatory control period, which ends on 31 December 2020. As the STPIS targets must be reviewed in the determination to apply from 1 January 2021, we consider this a timely opportunity to also assess the reliability benefits of REFCL operation and consider them in setting future STPIS targets.

The Minister also queried whether the DFA costs for modification of the DFA system were duplicated from tranche one. The DFA modifications include new, more sensitive, current sensing components which have to be installed in each ACR and logic. In addressing the logic component, AusNet Services states[75]

> *… the logic that is utilised in the DFA system is not compatible with the REFCL technology and therefore requires upgrading. However, since no distribution network downstream of any zone substation location is identical, a single standardised design cannot be applied across each feeder. As such, the DFA logic needs to be reconfigured for each network segment to account for the changed network configuration and so changes to the scheme design is a bespoke exercise. This component has been costed on a per switch basis and so the cost is based on the volume work required in each tranche. As such there is no duplication of these costs.*

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).

Other program costs

We note that other cost items claimed include:

- Live Line Equipment purchases
- survey costs
- annual compliance at test sites
- CPA T2 development costs
- cables – reactive – testing
- cables – reactive – repairs
- cables – reactive – replacements.

We consider live line equipment, survey costs, annual compliance and tranche two development costs represent reasonable costs in relation to the network size and complexity.

AusNet Services proposes to allocate $6.8 million[76] to testing, repairing and replacement of its cables. See section 3.5.1 for a discussion of this item.

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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[75] AusNet Services: *REFCL contingent project application (tranche two),* April 2018.

[76] AusNet Services: *Total cost model (tranche two) CONFIDENTIAL,* April 2018.

Accelerated Depreciation

We accept AusNet Services' proposal to accelerate the depreciation of certain replaced assets arising from this contingent project decision.[77] Specifically, we agree with the accelerated depreciation of the following assets:

- Protection relays within zone substations
- Surge arrestors
- ACRs
- Sectionalisers
- 22kV HV overhead cables

With respect to the above assets, we assign a collective remaining life of two years for accelerated depreciation purposes. This approach produces a depreciation schedule for these assets that will align with their reduced economic life.[78] We consider this treatment is in line with our final decision for AusNet Services' 2016–20 distribution determination.[79]

[77] Accelerated depreciation does not change the total amount received in depreciation (return of capital), though it does change the timing of the receipt and the consequential return on capital.

[78] NER, clause 6.5.5(b)(1).

[79] AER: *Preliminary decision AusNet distribution determination – Attachment 5 – Regulatory depreciation*, October 2015, pp. 13–17.

3.6 Operating expenditure (Opex)

3.6.1 Forecast

Table 3.7: AusNet Services REFCL Contingent Project Application and Operating Expenditure cost summary for tranche two of REFCL installations

Forecast Operating & Maintenance ($000's, Real 2015)						
	2016	2017	2018	2019	2020	Total
Fault response & analysis	-	-	-	24	96	120
Operating, maintenance and testing instructions	-	-	-	-	4	4
Routine maintenance of zone substation assets	-	-	-	-	9	9
Network Balancing	-	-	-	18	78	96
Annual Testing	-	-	-	-	143	143
WOTS - (Transmission Charges)	-	-	-	-	11	11
Live line equipment purchases	-	-	-	116	348	463
Training & Change Management	-	-	-	-	-	-
Regulation & Code Changes	-	-	24	-	-	24
Alternative technologies and vendors	-	-	-	926	435	1 361
Total Opex	-	-	24	1 084	1 125	2 233

Source: AusNet Services: *REFCL contingent project application (tranche two), Total Cost Model, Revised HV customers removed,* August 2018.

3.6.2 Analysis

Annual testing and network balancing costs are higher than Powercor reflecting AusNet Services' strategy to test each feeder each year and address the ongoing balancing requirement. The costs have reduced significantly from the tranche one amounts. We consider that the costs reasonably reflect 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).

Fault response and analysis costs have risen in proportion to the complexity and size of the networks in tranche two. We consider the costs are reasonable to meet industry standards and are based on fault response experience. We consider the costs reasonably reflect 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).

We consider operating maintenance and testing instructions costs are reasonable to meet industry standards. We also consider they reasonably reflect the opex 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).

Routine maintenance of zone substation assets has reduced significantly in comparison to tranche one. We consider these costs reasonably reflect the opex 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).

We consider live-line equipment purchases costs are appropriate for the tranche two networks' complexity and scope. We note these costs are finite and consider they reasonably reflect the opex 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).

3.6.3 Operational Expenditure

AusNet services has estimated operational expenditure of $2.2 million in tranche two.[80]

In its application AusNet Services claimed $1.4 million for alternative technologies and vendors. We note the BMR establishes particular standards which can currently only be met by REFCLs. AusNet Services has sought funds to develop alternative technologies for future use which will enable it to diversify the technologies it uses to meet the BMR.

We are not satisfied that AusNet Services has justified this allowance. As the project is now substantially underway, any benefits of identifying an alternative supply source are likely to be minimal. Moreover, if an alternative source of supply were identified this cost could be funded from the savings achieved on the allowances granted in this decision.

We consider the operational expenditure reasonably required for the purpose of undertaking the project in each year of the regulatory period is $872 000 in total.

3.6.4 Comparison of Powercor and AusNet Services

We benchmarked similar operational works including:

- live-line equipment purchases
- survey costs
- annual compliance test sites
- program management office
- CPA T2 development costs
- phase ID tools and training.

AusNet Services capitalised an amount of $5.4 million[81] and operational expenses of $2.2 million. Powercor estimated operational expenditure of $4.8 million[82] for similar expenses.

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80 AusNet Services: *Revised total cost model (tranche two) CONFIDENTIAL,* August 2018.

81 AusNet Services: *ASN Total cost model CONFIDENTIAL,* April 2018.

82 Powercor: *REFCL2_MOD.01 Expenditure build up model (tranche two),* April 2018.

Table 3.8 Opex benchmarks

Comparison	AusNet Services ($'000)	Powercor ($'000)
Opex	2 233	4 837
Capex	5 369	-
5 year total	7 602	4 837
Average per zone substation (tranche two)	950	967
Average per zone substation (tranche one)	838	829

Table 3.8 compares AusNet Services and Powercor. We note the average cost per substation has increased from tranche one. We also accept there is a proportional increase in size and complexity of networks in tranche 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).

4 AER's calculation of the annual revenue requirement

4.1 Capital expenditure

AusNet Services proposed $134.4 million capital expenditure to provide for REFCL installation and supporting works for eight zone substations in tranche two of the REFCL program.[83] AusNet Services provided supporting evidence and detailed cost estimates to make the contingent project application.[84] 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 reduced the allocation for HV customer isolation transformers by $10.8 million as discussed in section 3.5.1.

We have allocated $123.5 million for capital expenditure.

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

4.2 Operating expenditure

AusNet Services claimed $2.2 million in operating expenditure to provide for REFCL installation and supporting works for eight zone substations in tranche two of the REFCL program.[85] AusNet Services provided supporting evidence and detailed cost estimates to make the contingent project application.[86] 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 consider the operational expenditure reasonably required for the purpose of undertaking the project in each year of the regulatory period is $872 000 in total.

As set out in the next section, to adjust the opex amounts sought by AusNet Services we calculated the adjustment to the inputs into the post-tax revenue model in real, 2015 dollars.

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 allocated amount, we have made an allowance for this. The time cost of money is based on the most recent rate of return for AusNet Services, as set out in the 2016–20 distribution determination.[87] We have

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83 AusNet Services: *REFCL contingent project application (tranche two),* April 2018.

84 AusNet Services: *REFCL contingent project application (tranche two), Total Cost Model, CONFIDENTIAL,* 2018.

85 AusNet Services: *REFCL contingent project application (tranche two),* April 2018, p. 36.

86 AusNet Services: *REFCL contingent project application (tranche two), Total Cost Model, CONFIDENTIAL,* April 2018.

87 AER: *Final decision, AusNet Services distribution determination 2016 to 2020.*

also updated the values for X-factor and return on debt in year 2 to 4 under the trailing average methodology which now applies.[88]

The smoothed revenue arising from this contingent project is then calculated by adjusting the X-factors for years 4 and 5 to maintain final year revenue within 3.0% of the target value.

4.4 Calculation of revenue requirement

Table 4.1: AER Allowance - AusNet Services Contingent Project Revenue Requirement, 2016-2020 ($m, nominal)

	2016	2017	2018	2019	2020
Return on Capital	0.0	0.1	0.1	1.2	5.9
Return on Capital (regulatory depreciation)	0.0	0.0	0.0	2.9	4.9
Operating Expenditure	0.0	0.0	0.0	0.2	0.8
Revenue Adjustments	0.0	0.0	0.0	0.0	0.0
Net Tax Allowance	0.0	-0.1	-0.1	0.6	0.7
Annual revenue requirement (unsmoothed)	0.0	0.0	0.1	4.8	12.3
Expected revenue (smoothed)	**0.0**	**0.0**	**0.0**	**9.8**	**7.2**
% change to revenue	**0.00%**	**0.00%**	**0.00%**	**1.51%**	**1.04%**
X-factors	**8.27%**	**0.30%**	**-1.84%**	**-3.01%**	**-3.01%**

For this contingent project, revenue is determined by allocating the incremental opex to opex and the incremental capex amount 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.

4.5 Inflation revocation PTRM

The contingent project application was made using a version of the AER's post-tax revenue model (PTRM) which included an expected inflation input arising from the 2016-20 distribution determination. Subsequent to this application, on 25 May 2018, we substituted the 2016-20 distribution determination to correct for an inflation estimation error and published an amended version of the PTRM. Our decision for this contingent project therefore uses the amended version of the PTRM.[89]

[88] In this decision, the year 4 return on debt update has been further updated following RBA data revisions.

[89] AER: *Letter proposing revocation and substitution of AusNet Services (SP AusNet) distribution determination 2016-2020.*

5 AER determination

5.1 AER determination

On 31 August 2018, the AER Board determined that the AusNet Services application for contingent project funding lodged on 20 April 2018 was approved with modifications to the amounts sought. AusNet Services submitted is application in real $2015. We presented calculations for incremental capital and operating expenditure in each remaining year of the regulatory control period in real $2015. This is because the PTRM calculation is expressed in real $2015.

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 is as follows.[90]

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

	2016	2017	2018	2019	2020
Incremental capital expenditure	0.0	0.0	15.8	67.8	39.8
Incremental operating expenditure	0.0	0.0	0.02	0.16	0.69

Table 5.1 demonstrates:

- the total capital expenditure we consider is reasonably required for the purpose of undertaking the contingent project is $123.5 million (real, $2015).[91]
- the contingent project has commenced and the likely completion date is 30 April 2021.[92]

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),[93] we have calculated the incremental revenue which is likely to be required by AusNet Services for each remaining regulatory year as a result of the contingent project being undertaken to be as follows.[94]

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

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

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

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

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

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

	2016	2017	2018	2019	2020
Return on capital	0.0	0.1	0.1	1.2	5.9
Return of capital (regulatory depreciation)	0.0	0.0	0.0	2.9	4.9
Operating expenditure	0.0	0.0	0.0	0.2	0.8
Revenue adjustments	0.0	0.0	0.0	0.0	0.0
Net tax allowance	0.0	-0.1	-0.1	0.6	0.7
Incremental annual revenue requirement (unsmoothed)	**0.0**	0.0	0.1	4.8	12.3
Expected revenue (smoothed)	**0.0**	**0.0**	**0.0**	**9.8**	**7.2**
% change to revenue	**0.00%**	**0.00%**	**0.00%**	**1.51%**	**1.04%**

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.[95]

We determine the effect to be as follows.

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

	2016	2017	2018	2019	2020
Annual revenue requirement (unsmoothed)	588.99	579.25	619.77	672.67	698.00
Expected revenue (smoothed)	586.05	597.87	623.02	656.87	692.56
X-factors	8.27%	0.30%	-1.84%	-3.01%	-3.01%

We have determined incremental contingent project unsmoothed revenue amount to be $17.2 million ($nominal). This is the amount that AusNet Services will recover from customers over three years commencing 1 January 2018. This is different from the building block amount of $25.6 million ($nominal) proposed by AusNet Services.

[95] NER, clause 6.6A.2(h)(3).

We further determine the smoothed annual revenue requirement should be adjusted to $3.156 billion ($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 $3.159 billion ($nominal).

We have not amended the roll-forward model.

This corresponds to an increase in average distribution network prices of 1.51% in 2019 and 1.04% in 2020.

Appendix A – Impact on a typical Customer Bill

Our estimate of the potential impact this decision will have for AusNet Services' residential customers is based on the typical annual electricity usage of around 4,000kWh per annum for a residential customer in Victoria.[96] Therefore, customers with different usage will experience different changes in their bills. We also note that there are other factors, such as transmission network costs, metering, wholesale and retail costs which affect electricity bills. The potential impact on small business customers, however, is estimated differently. We make a pro-rata adjustment to the annual bill for a typical small business customer as calculated in our 2016–20 distribution determination, reflecting the updates made to residential customer bills in this decision. This is due to a limitation in the Victorian Energy Compare comparison tool.[97]

Table A shows the estimated annual average impact of our determination on AusNet Services' REFCL contingent project tranche two on the average residential and small business customers' annual electricity bills. As explained above, these bill impact estimates are indicative only, and individual customers' actual bills will depend on their usage patterns and the structure of their tariffs.

Table A – Estimated impact of AER's decision on AusNet Services' REFCL contingent project, tranche two on annual electricity bills for 2019 and 2020 ($, nominal).

Impact on Customer Bill	2018	2019	2020
Change to distribution component for contingent project (%)		**1.5%**	**1.0%**
Residential Customers			
Distribution component ($)[a]	649	659	666
Residential annual electricity bill ($)[b]	1,910[b]	1,920	1,927
Annual change (%)		0.5%	0.4%
Annual change ($)		10	7
Small Business Customers			
Distribution component ($)[a]	1,392	1,413	1,427
Small business annual electricity bill ($)[c]	4,093[c]	4,114	4,129
Annual change (%)		0.5%	0.4%
Annual change ($)		21	15

a Distribution network proportions are consistent with the AER's 2016-20 distribution determination.

b Based on average standing offers at June 2017 on Victorian Energy Compare comparison tool (postcode 3134) using annual bill for typical consumption of 4000kWh per year.

c Based on typical small business annual bill as per the AER's 2016-20 distribution determination, using a pro-rata step change reflecting a similar proportion to the residential bill updates.

Source: AER analysis

96 ESC, *Victorian energy market report 2016-17,* November 2017, p. 28.

97 Victorian Energy Compare (AGL standing offer)

Appendix B - List of stakeholder submissions

Submission from	Date
Victorian Minister for Energy, Environment and Climate Change	15 June 2018
Groundline Engineering	15 June 2018