Consultation Notice

Endeavour Energy

Trial Waiver Application

2023

AUSTRALIAN ENERGY REGULATOR

Australian Government

Energy Innovation Toolkit

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1 Executive Summary

The Australian Energy Regulator (**AER**) has recently launched its new Trial Waiver function as part of the new Energy Innovation Toolkit. This function allows the AER to grant time-limited waivers from certain regulations which may be acting as barriers to new ideas and new innovative energy services. As part of its consideration of Trials, the AER is required to publicly consult on the proposals it receives.

The trial proponent, Endeavour Energy (**Endeavour**), lodged an application for a trial waiver with the AER through the Energy Innovation Toolkit on 27 February 2023. A copy of this application is included with this Consultation Notice as **Attachment A**. Additional workings justifying financial net benefits for each trial location are included in **Attachment B.**

The Trial proposed by Endeavour relates to a roll-out of smart meters to around 10,250 residential customers across Marsden Park, Penrith, Bawley Point, Aerotropolis and Westmead in New South Wales. Endeavour intends to install these meters to target network constraints in a cost-effective way utilising in-meter load control.

The Trial represents the continuation of a trial conducted during 2020-21 which involved transitioning approximately 2,850 customers in the Albion Park area to smart metering. This initial roll-out in 2020 was conducted as part of the AER's Demand Management Incentive Scheme (DMIS) for 2019-2021. More information about this scheme can be found here.[1]

Endeavour has indicated that this trial enabled it to decommission the load control system at the Albion Park zone substation and move to in-meter based load control. Endeavour has indicated that the Albion Park project also provides potential benefits associated with improving solar hosting capacity through utilising distributed solar resources to manage electric hot water load.

Presently metering installations are the responsibility of the relevant retailer and its appointed metering coordinator. Endeavour as a distribution network service provider (**DNSP**) would not ordinarily have a role in the upgrading of metering installations to smart meters, but provisions exist for DNSPs to upgrade metering installations (after giving notice) where the meter in question is faulty. This is done through what is called the metering fault notification. Endeavour intends, through this trial, to issue a metering fault notification in relation to meters which are not registering a fault.

Endeavour's objective is to create a replicable "proof of concept" that addresses network constraints at the lowest overall cost while maximising customer benefits through accelerating the take-up of smart metering. The local distribution network operated by Endeavour will then utilise the collective load control functionality of these smart meters. Overall, Endeavour Energy considers the approach will help it to better manage the low

[1] https://www.aer.gov.au/system/files/AER%20Decision%20-%20Approval%20of%20Demand%20Management%20Incentive%20Scheme%20%28DMIS%29%20incentives%20for%202019%E2%80%9320%20-%20April%202021%20v3.pdf

voltage network to improve solar hosting, power quality and safety and reduce long-term investment.

The AER is now consulting on the proposed trial waiver application and seeking stakeholder views on matters including whether the trial waiver application meets the eligibility requirements and the innovative trial principles.[2]

Details of the specific trial waiver application from Endeavour Energy are presented in Section 2 of this Consultation Notice, and a full copy of Endeavour Energy's application is included as Attachment A.

1.1 About the AER

The AER exists to ensure energy consumers are better off, now and in the future. Consumers are at the heart of our work, and we focus on ensuring a secure, reliable, and affordable energy future for Australia. Energy is an essential service for Australian households and businesses, and a critical contributor to the long-term success of the Australian economy.

We regulate electricity networks and covered gas pipelines in all jurisdictions except Western Australia. We set the amount of revenue that network businesses can recover from customers for using these networks. We protect the interests of consumers by enforcing the laws for electricity and gas wholesale and retail market, as well as networks, across southern and eastern Australia. We monitor and report on the conduct of market participants and the effectiveness of competition.

The AER also administers a range of regulatory sandboxing functions, including the Energy Innovation Toolkit, which was launched in August 2022. The Energy Innovation Toolkit includes an Innovation Enquiry Service which provides guidance to innovators and other market participants about how the current regulatory framework might apply to their proposed product or service.

It also includes two trial functions – a trial waiver function which is the responsibility of the AER and a trial rule change function which is the responsibility of the Australian Energy Market Commission (AEMC). Both kinds of trial temporarily remove or amend an energy regulatory barrier, allowing an innovative business model to be tested that would normally be unable to proceed under current frameworks. A Trial Projects NE Guideline was also published in January 2022 to explain how the AER will consider and assess trial waiver applications.

This consultation notice relates to our trial waiver function under the national energy laws.

[2] The AER must have regard to the eligibility requirements (specified in the National Energy Rules) and innovative trial principles (specified in the National Energy Laws) when considering whether to grant a trial waiver. For more information see *1.3 – How we assess waiver applications* below.

1.2 Trial waivers

A trial waiver temporarily exempts an innovator from having to comply with specific laws or rules that may be acting as regulatory barriers to allowing an innovative trial to proceed. Trials are limited to five years, with the possibility of a once-off extension of up to one year.

Trial waivers facilitate trials for new approaches, services or models that may be in the long-term interests of consumers but cannot be trialled under the current regulatory framework. In doing so, these trials can provide evidence to support permanent changes to the rules to ensure they remain fit-for-purpose in serving the long-term interests of consumers.

The trial waiver process is not to be viewed as an alternative, but rather as a complement to existing processes and frameworks. Where evidence exists that a rule is no longer fit-for-purpose in serving the long-term interests of consumers, entities are encouraged to submit a rule change to the AEMC.

The AER may, on application by a person or body that proposes to undertake a trial project (the proponent), make a determination to grant the proponent an exemption (a trial waiver) from one or more of the following:

a) section 11 of the National Electricity Law (which concerns registrations) and/or the National Electricity Rules (NER) or a provision of the NER[3]

b) section 88 of the National Energy Retail Law (which concerns retail authorisations) and/or the National Energy Retail Rules (NERR) or a provision of the NERR[4]

c) section 91BJ, section 91BRD, section 91BRR and/or section 91LB of the National Gas Law (which concern registrations and authorisations) and/or the National Gas Rules (NGR) or a provision of the NGR.[5]

1.3 How we assess trial waiver applications

In considering whether to grant a trial waiver, the AER will have regard to the following eligibility requirements specified in the National Energy Rules[6] and the innovative trial principles specified in the National Energy Laws.[7] Clause 4.2 of the Trial Projects Guidelines sets out our proposed approach to assessing whether the eligibility requirements and innovative trial principles are met.

The AER is required to have regard to whether a trial project meets the eligibility requirements and innovative trial principles in deciding whether to grant a waiver, but there is

[3] NEL clause 18ZL(1)

[4] NERL clause 121C(1

[5] NGL clause 30W(1)

[6] NER clause 8.16.4(a); NERR clause 178(1); NGR clause 135MC(1).

[7] NEL section 18ZL(2); section NERL 121C(2); section NGL 30W(2).

no requirement that the AER must be satisfied that all requirements and principles are met to grant a waiver. The AER will take a holistic approach to the consideration of the eligibility requirements and innovative trial principles when assessing each application.

This flexibility is appropriate, since there may be circumstances where not all requirements and principles are met, but there is merit in a trial proceeding. However, the AER is more likely to grant a trial waiver where we are satisfied that a trial project meets all the innovative trial principles, and the eligibility requirements that are set out in clause 4.2(c) of the Trial Projects Guidelines. Some of these factors include:

- Eligibility requirements under the Energy Rules
  - Whether the trial project is likely to contribute to the development of regulatory and industry experience
  - Whether the trial project may have an adverse effect on AEMO's operation and/or administration of the power system, market or other aspect of the energy sector
- Innovative trial principles – as set out in the Energy Laws
  - Whether the trial project is likely to contribute to the achievement of the national energy objectives
  - Whether the trial project maintains adequate consumer protections
  - Whether the trial project is unable to proceed under the existing regulatory framework
- Innovative trial principles – as set out in the regulations
  - Whether the trial project is able to be trialled and evaluated
  - Whether there is potential for the trial project to be successfully expanded

1.4 The purpose of this consultation

Industry and consumer engagement is a valuable input to our determinations. It is a requirement under clause 8.16.3 of the NER that the AER carry out public consultation in relation to a proposed trial waiver, unless the AER is satisfied that the proposed waiver is unlikely to have an impact on other registered participants, or is unlikely to have a direct impact on retail customers other than those who provide explicit informed consent to participate in the trial project.

Additionally, issues or concerns raised through consultation may also inform the final design of the trial waiver, including conditions, reporting requirements or other obligations.

When we receive stakeholder submissions that articulate the views of participants and consumers (as well as other stakeholders), particularly in relation to consumer preferences, issues in a regulatory proposal, and reasons supporting and opposing a determination, our decision-making process is strengthened.

1.5 Confidential information

To facilitate an informed and transparent consultative process we prefer all submissions to be publicly available. The AER will treat all submissions as public documents unless otherwise requested, and blanket confidentiality claims generally will not be accepted.

Parties wishing to provide a submission that contains confidential information are requested to:

- clearly identify the information that is the subject of the confidentiality claim, and provide reasons for the claim; and
- provide a separate, non-confidential version of the submission in a form suitable for publication.

The AER does not generally accept blanket claims for confidentiality over the entirety of the information provided and such claims should not be made unless all information is truly regarded as confidential. The identified information must be genuinely of a confidential information and not otherwise publicly available.

The AER recognises that the disclosure of confidential commercial information in respect of a business may have a substantial adverse effect on the interests of that business. However, trial waivers may also substantially affect other parties (such as access seekers or competitors) and some disclosure of information may be necessary for open and transparent decision-making.

For further information regarding the use and disclosure of information provided to us, see the ACCC/AER Information Policy, published June 2014.

1.6 Next Steps

Submissions to this consultation should be lodged at the following email address: regulatorysandbox@aer.gov.au by 6 June 2023. Any queries about this consultation can also be lodged at the same email address.

Following the close of the consultation period of at least 20 business days, the AER will consider the submissions and any concerns or issues raised through this process. Where necessary, further information may be sought from the project proponent.

Following this, the AER will make and publish a formal decision. Depending on this outcome, the AER will provide details on the final waiver as outlined in section 4.8 of the Trial Projects Guidelines.

2 Trial project summary

The trial proponent, Endeavour Energy (**Endeavour**), lodged an application for a trial waiver with the AER through the Energy Innovation Toolkit on 27 February 2023.

In January 2023 a Letter of No Action (**LONA**) request was received from Endeavour, further to an earlier LONA granted in 2020 regarding the replacement of 2,850 meters in a part of the network, Albion Park on the south coast of New South Wales, where load control infrastructure was underperforming, and it was considered more cost-effective to instead install smart meters than to upgrade the infrastructure. Whilst the meters themselves were not faulty, the replacement was done under a meter fault notice process, which in the absence of actual faults required the LONA. Customers were able to opt out of the replacement if desired. The Albion Park trial undertaken in 2020 was conducted as part of the AER's Demand Management Incentive Scheme (DMIS) for 2019-2021.

Endeavour's second LONA request related to a number of additional areas where smart meter installations were considered desirable to address various network concerns. It proposed to utilise the same process as occurred under the original 2020 LONA. This was identified as a project better suited to the Regulatory Sandboxing trial waiver process and this application was subsequently made.

2.1 Details of proposal

The trial proponent is seeking to address network risks through the deployment of type 4 (smart) meters and using in-meter based load control.

Following the 1 December 2017 implementation of the 2015 Power of Choice initiative *'Expanding competition in metering and related services'*, responsibility for the installation of smart meters transferred from distributors to retailers. As the proponent notes, this has limited their ability to influence where and when smart meters are installed.

As such, the proponent is seeking a waiver to undertake meter swaps in other locations in line with the process undertaken for Albion Park, whereby a Meter Fault Notice (MFN) is issued to initiate the meter swap. For the purposes of this trial, Endeavour is seeking a waiver from clauses 7.8.10 and 7.8.6(a)(2) of the NER

Endeavour has committed to engage with local retailers, and to provide a financial incentive sufficient to support the commercial arrangements between metering providers and affected retailers so that affected customers will not bear any charge or fee for the meter swap.

It is proposed this will address network constraints at the lowest overall cost while maximising customer benefits through accelerating the take-up of smart metering.

2.2 Initial consideration under cl. 8.16.2

The AER has reviewed the application and considers that it complies with the information and eligibility requirements and that the proposed trial project could not be carried out satisfactorily without a trial waiver.

The AER does not consider the application to be misconceived or lacking in substance and the waiver has now progressed to the consultation stage.

3 Questions for consultation

The AER seeks comments broadly on all aspects of the trial waiver application, including as to how the application addresses the innovative trial principles, the eligibility criteria and the suitability of the trial under the National Energy Objectives. Views put forward by stakeholders will form part of the substantive assessment of the application which the AER will undertake after consultation is complete.

The following questions are separately noted as these are points on which the AER is particularly interested in stakeholder views.

3.1 Contribution to regulatory and industry experience

As noted by the proponent, the AEMC is currently undertaking a review of the regulatory framework for metering services to accelerate the deployment of smart meters in the National Electricity Market. At the time of publication, the AEMC is currently considering responses to their draft report.

As outlined in the Trial Project Guidelines, the first eligibility requirement under the Energy Rules requires an assessment of how the trial project is likely to contribute to the development of regulatory and industry experience. The Endeavour application notes that this expansion of the MFN proposal provides a proof-of-concept as AEMC is considering ways of accelerating smart meter take up. As discussed above, this proposal is to undertake an expansion of the trial undertaken at Albion Park.

Views or comments on how this trial contributes to the development of regulatory and industry experience are also welcomed.

The AER would also welcome feedback on whether the trial would help inform smart meter policy development, noting that the AEMC is currently undertaking a review of the regulatory framework for metering services.

3.2 Explicit consent and opt-out provisions

As per clause 6.3(a) of the Trial Projects Guidelines, unless otherwise agreed, retail customers participating in a trial project must be able to opt out of the trial project at any time for any reason. Similarly, as per clause 4.4(a), the trial waiver proponent must obtain explicit informed consent from retail customers before they participate.

How Endeavour Energy proposes to gather this approval and the nature of the opt-out mechanism is outlined in the Consumer Protection section of the application, and includes activities such as:

- Issuing a Power Interruption Notification (PIN) notifying the customer of the metering swap.
- Providing a contact number should the customer have concerns
- Ability for the customer to raise concerns up to and including the day of the meter swap
- Ability to opt-out through receiving a Type 4A meter.

As the Endeavour Energy application notes, this proposal is consistent with the arrangements for Albion Park.

The AER welcomes feedback on whether or not the proposed process provides sufficient opportunity for customers to provide their explicit consent and exercise their right to opt-out of the trial if they wish to.

3.3 Competition

When taking into consideration whether to grant a trial waiver, the AER has regard to the innovative trial principles as outlined in clause 4.2 of the Trial Projects Guidelines. Of these innovative trial principles, clause 4.2.(xii) includes whether the trial project may impact on competition in a competitive sector of the market. Following the Contestability in metering services rule change, the provision of metering services is undertaken on a competitive basis with the provision of metering installations led by retailers.

As part of the application, the proponent notes that the project will not adversely impact competition and all retailers will be able to participate through active engagement by Endeavour (and the expressly noted option for retailers to implement their own smart meter roll-outs). Additionally, Endeavour notes in its application that it was anticipated that a competitive market would incentivise retailers to proactively roll out smart meters which, in Endeavour's view, has not occurred as anticipated. Endeavour, through this application, proposes to implement a faster roll-out of smart meters in these locations through an approach which is primarily distributor led.

The AER welcomes views on how allowing the DNSP (in this case the proponent) to provide these services may impact on the competitive market.

Views or comments on the relative size of the competition impacts versus the potential consumer benefits are also welcomed.

Attachment A – Trial Waiver Application

Title: Endeavour Energy - Off Peak Plus trial

Applicant: Endeavour Energy

Applicant ABN: 11 247 365 823

Submission date: 8 March 2023

Application contact: Patrick Duffy, Manager, Regulatory Transformation & Policy

Proposed waiver: National Energy Rules: Exemption from clause 7.8.10 and 7.8.6(a)(2)

Applicant licenses/registration

- Electricity distribution license
- Market Network Service Provider registration

Project description

Project location: New South Wales. The project will involve approximately 10,250 residential customers across Marsden Park, Penrith, Bawley Point, Aerotropolis and Westmead.

Trial project description: The trial is a non-network initiative that involves addressing network risks through the deployment of Type 4 (smart) meters and using in-meter based load control.

This represents the continuation of a trial conducted during 2020-21 in Albion Park that was facilitated by a Letter of No Action from the AER (as the Regulatory Sandbox reforms were not yet in place). The Albion Park trial involved transitioning approximately 2,850 customers in the Albion Park area to smart metering as a technically compliant and lower cost alternative to replacing the load control system. This enabled us to decommission the load control system at Albion Park zone substation and move to in-meter based load control. The project subsequently became known as Off Peak Plus.

To implement the solution, Intellihub (a metering provider) and participating retailers requested that Endeavour Energy fail the associated network owned load control devices at each of these premises under the Meter Fault Notification (MFN) process as this was identified as the most efficient way to initiate the meter swap. It was our understanding this would breach clause 7.8.10 of the NER as the issuance of an MFN pertains only to a metering installation and not a network device as defined by the NER. In the absence of an alternative option to deliver targeted and timely meter swaps, we requested the AER take no enforcement action for utilising the MFN process (which the AER provided).

Off Peak Plus has successfully delivered an improved and consistent hot water service to off peak customers in Albion Park and has addressed the risk of load control system failure (e.g. system overloading and ongoing loss of supply events) at a substantially lower cost than the network replacement alternative. In this regard, it has delivered the desired outcomes and satisfied the network need.

More broadly, Off Peak Plus has been heralded as an innovative demand response program which has demonstrated the effectiveness of utilising smart meter functionalities in a real world setting to operate controlled load in a reliable and cost-effective manner. Notably, the

program has improved our ability to host more rooftop solar in the Albion Park area through enabling “solar soaking” of the hot water systems in collaboration with retailers.

Off Peak Plus could prove to be a scalable and repeatable use case that can deliver benefits to customers and address constraints that have emerged on other areas of our network. We are also engaging with retailers and other metering service providers to investigate opportunities to broaden participation in the project.

Aims, objectives and success criteria: Our objective is to address network constraints at the lowest overall cost while maximising customer benefits through accelerating the take-up of smart metering and utilising its load control functionality.

Leveraging from our Albion Park experience, we consider re-testing the broader non-network market is highly unlikely to yield any competitive non-network alternative to smart metering from both a technical and cost/benefit perspective. Also, with the smart meter services market dominated by a few participants it would be more effective for us to liaise with relevant participants directly rather proceed with a formal open market process. We therefore propose to avoid the costs and delays associated with inviting proposals from the market as we look to expand the Off Peak Plus project.

The expansion of the program will target network constraints in five network locations which are detailed in an attachment to this application. In some instances, the constraint resembles the load control system failure risk identified at Albion Park. In others, controlled load units at zone substations (e.g. Marsden Park) will be decommissioned in favour of more efficient meter-based load control as part of a broader augmentation project.

It is our belief the “solar soaker” function has application more broadly across the network as a low marginal cost approach to improve hosting capacity and could be extended in the future to provide cost effective access to electric vehicle charging. Customers have also indicated they value the improved access to clean and cheaper forms of renewable energy the program has enabled.

Importantly it also provides Endeavour Energy firm access to valuable smart meter data that can be used to unlock a range of customer and network benefits. This has allowed us to detect serious safety issues with neutral connections, detect when power is out and enhance our voltage management to allow greater solar power flows back into the grid. We can use this data to better respond to network issues and outages, particularly during storms, giving customers even safer and more reliable energy supply.

Furthermore, Off Peak Plus provides improved metrology to allow retailers to offer cost reflective pricing structures and support greater customer control over their energy usage and bills. In addition, it gives retailers the scope to provide new products for consumers to help reduce peak demand and drive down electricity costs.

Off Peak Plus stands out as a rare example of effective collaboration and cooperation between a DNSP, retailers and metering service provider to facilitate a network-led smart meter roll out.

Whilst the objectives of the project are addressing the specific network constraints, these additional benefits are also important factors in assessing its success.

Waiver details

Intended commencement: Less than 6 months.

Intended waiver duration: 2.5 years (until mid-2025).

Waiver requirement: Since responsibility for installing smart meters transferred from distributors to retailers following the commencement of the Contestability in metering services rule change on 1 December 2017, our ability to influence where and when smart meters are installed has been limited to the circumstances outlined in the NER.

To help replicate the successful outcomes achieved in Albion Park, participating retailers have requested Endeavour Energy follow the same process to initiate meter swaps in other locations – that is, fail the associated network device or meter under the MFN process. This requires exemption from clause 7.8.10 and 7.8.6(a)(2) of the NER.

We note that one retailer opted to install meters in Albion Park under a retailer-led approach soon after the project commenced, and we will work with retailers to investigate opportunities to minimise the use of MFNs. A retailer-led approach, which complies with the NER, remains our preference for expanding this initiative.

However, we understand this approach can be costly, less effective, and difficult for smaller retailers to manage. As a result, we consider it necessary to preserve our ability to trigger a swap under the MFN process to ensure the project is not delayed or hampered by piecemeal or incomplete meter swaps.

Monitoring and reporting: It is our intention to report to the AER periodically on concerns and complaints received regarding the expanded project, although new timeframes may be needed to correspond to the commencement of the metering works. We will also provide a final project report, to the extent this is not already addressed by any reporting under the DMIS (if utilised).

Infrastructure and assets: Yes, the project will include the installation of smart meters (Type 4) or non-comms enables smart meters (Type 4A) where the customer elects to opt out from the swap. Noting that Endeavour Energy will provide a financial incentive sufficient to support the commercial arrangements between metering providers and affected retailers so that affected customers will not bear any charge or fee for the meter swap.

Previous consultation: Australian Energy Market Operator (AEMO); Australian Energy Market Commission (AEMC); Other federal or state agency; Australian Energy Regulator (AER); Energy & Water Ombudsman NSW (EWON)

Risk management

Consumer impacts

Benefits: The benefits include:

- Alleviating a network constraint. This will be measured as the deferral value (temporary or permanent) of the traditional network solution which may range from the replacement of AFIC equipment to augmentation to increase network capacity depending on the specific constraint.
- Improved export hosting. This will be measured using the AER's DER Integration Guidance note which includes the AER's CECV estimate.
- Access to power quality data to improve network monitoring. This can have reliability, power quality, export hosting and network safety benefits.

- Support the transition to cost-reflective tariffs and ability for retailers to offer new products to customers.

Customers benefit from lower cost network solutions, improved access and flexibility to make use of renewable generation, an improved and consistent hot water service and an improved ability to monitor and control their energy usage through access to a smart meter.

Consumer communication: We will provide Energy & Water Ombudsman NSW (EWON) advanced notice of planned smart meter deployments under the Off Peak Plus project and will manage customer objections in accordance with the MFN process, namely:

- Customers will receive a Power Interruption Notification (PIN), within the time frames required by NECF, notifying them of the metering swap and the date of the swap will occur. It will be sent to the customer by the Retailer directly or by the Metering Coordinator on behalf of the Retailer.
- A contact number for either the Retailer or Metering Coordinator call centre is provided should the customer have concerns.
- The customer can raise their concerns upon receiving the PIN up to and including on the day the meter technician attends to perform the meter swap.
- A customer objection will result in a Type 4A meter (non-communicating) being offered in the first instance with the opportunity to 'opt out' if they remain sensitive to around the installation of a smart meter.

Also, we will ensure metering providers, participant retailers and Endeavour Energy call centres have consistent scripting and information on the project should customers contact either party and raise concerns.

Consumer privacy: The project relies on retailers to communicate with customers per the ordinary requirements of the MFN process, no confidential customer information is exchanged between participating parties.

Eligibility requirements

Risk management plan: We note this project creates no specific risks beyond those which already exist as part of the smart meter transition more broadly. These risks are managed by allowing for customer opt-out per the MFN process in the NER as well as proactively engaging with EWON. The MFN process will flag any customer objections or concerns.

We do not consider there are any risks to other market participants.

The project will improve network safety and reliability through our improved access to power quality data.

Operational capability: Our Albion Park Off-peak Plus trial involving 2,850 customers provides evidence of our ability to successfully carry out this project. The project was completed per the conditions specified by the AER and with no formal complaints lodged via either the NSW EWON or via Endeavour Energy's call centre.

Exit strategy: We consider the AEMC's Competition in Metering Review will accelerate the roll-out of smart metering. In doing so, it is likely that networks will have an expanded ability to trigger meter swaps to target areas of network need / greatest customer benefit. These

reforms are likely to vary the MFN process and obviate the need for this exemption once implemented.

Regulatory and industry development: Since responsibility for installing smart meters transferred from distributors to retailers following the commencement of the Contestability in metering services rule change on 1 December 2017, our ability to influence where and when smart meters are installed has been limited. It was anticipated that competition would incentivise retailers to proactively roll out smart meters to customers en masse and enable the benefits of smart meters (including those mentioned in the section above) to be realised.

These expectations have not been met with measures to accelerate the rollout currently the focus of the Australian Energy Market Commission's (AEMC) Review of the regulatory framework for metering services. This includes allowing third parties, including DNSPs, to become responsible for metering unencumbered by restrictions that currently prevent, delay or add cost to installing smart meters where they are valued by the DNSP.

The review is also considering the design of a new data access and exchange framework to address challenges encountered by non-Victorian DNSPs in negotiating with retailers and Metering Coordinators on accessing power quality data on reasonable commercial terms.

It is against this backdrop that Off Peak Plus stands out as a rare example of effective collaboration and cooperation between a DNSP, retailers and metering service provider to facilitate a network-led smart meter roll out. Importantly it provides Endeavour Energy firm access to valuable smart meter data that can be used to unlock a range of customer and network benefits. Upon launching the program, NSW Energy and Environment Minister Matt Kean commented that "nowhere else in Australia are we seeing this level of collaboration and innovation within the electricity sector to produce communitywide benefits."

We support the direction of AEMC's proposed metering reforms and consider there is scope to reduce some of the regulatory barriers which prevent a more efficient process for network-led smart meter installations.

In the absence of more streamlined arrangements that would allow DNSPs to play a more direct role in installing meters, it is our view that collaborating with retailers and metering service providers under the Off Peak Plus model remains the most effective way to facilitate the targeted and timely deployment of smart meters to manage network constraints.

Innovative Trial Principles

Whether the trial project is focused on developing new or materially improved approaches to the use or supply of, or demand for, electricity	The trial involves an improved approach to the existing MFN process. It allows networks to optimise the rollout of smart metering by prioritising areas where it will deliver the greatest customer benefit. It reflects a collaborative approach between networks, metering providers and retailers. This expansion of the MFN process provides a proof of concept at an opportune time as the AEMC consider ways of accelerating the take up of smart metering as part of its competition in metering review.
Whether the trial project is	The project represents a more efficient investment in, and

likely to contribute to the achievement of the national energy objectives	operation of, Endeavour Energy's distribution network for the benefit of customers. It is a lower cost solution to a network constraint that also advances the up-take of smart metering. In turn, this improves data access enabling customers to better manage their energy usage to achieve savings and it enables Endeavour Energy to better manage the LV network to improve solar hosting, power quality and safety and reduce long-term investment. It also supports the transition to cost-reflective pricing and enables retailers to offer new services to customers.
Whether the trial project is able to demonstrate a reasonable prospect of giving rise to materially improved services and outcomes for consumers of energy	The trial at Albion Park has demonstrated the numerous benefits of utilising smart metering load control functionality. Smart meter control allows for more flexible control of the heating times at the individual customer level by sending control signals direct to each meter through the meter providers remote API control interface. Both the network and retailer have access to control each meter, allowing both network management and retailer delivered market services (allowing for new customer offers). The Off Peak Plus program provides tremendous benefits to customers by soaking up excess solar energy during the day, providing a discount tariff. In addition to the benefits that solar soaking can provide this investment is also an alternate to: • replacing like for like end-of-life off peak ripple control systems in existing substations • installing new ripple control systems in a new substation that partially supplies an existing brownfield area where not all customers have transitioned to smart meters yet. This initiative is scalable to other services such as EV charging and provides us with smart meter information to help guide future investment and identify safety issues (neutral integrity monitoring).
Whether the trial project maintains adequate consumer protections, including whether the trial project may involve risks to consumers and (if so), how those risks might be mitigated	The project poses no additional risks to customers as it only accelerates the mandatory transition to smart metering that will otherwise occur. However, to manage the risk of adverse customer reaction the MFN process will notify customers of the change and their ability to opt-out for a Type 4A meter and raise any concerns they may have at a number of stages throughout the process.
Whether the trial project is unable to proceed under	Since responsibility for installing smart meters transferred from distributors to retailers following the commencement of

the existing regulatory framework	the Contestability in metering services rule change on 1 December 2017, our ability to influence where and when smart meters are installed has been limited to the circumstances outlined in the NER. To help replicate the successful outcomes achieved in Albion Park, participating retailers have requested Endeavour Energy follow the same process to initiate meter swaps in other locations – that is, fail the associated network device or meter under the MFN process. This requires exemption from clause 7.8.10 and 7.8.6(a)(2) of the NER. We note that one retailer opted to install meters in Albion Park under a retailer-led approach soon after the project commenced, and we will work with retailers to investigate opportunities to minimise the use of MFNs. A retailer-led approach, which complies with the NER, remains our preference for expanding this initiative. However, we understand this approach can be costly, less effective, and difficult for smaller retailers to manage. As a result, we consider it necessary to preserve our ability to trigger a swap under the MFN process to ensure the project is not delayed or hampered by piecemeal or incomplete meter swaps.
Whether the trial project has moved beyond research and development stages but is not yet established, or of sufficient maturity, size or otherwise commercially ready, to attract investment	The project has been established via the Albion Park trial and is of sufficient maturity to attract interest from retailers. Endeavour Energy can fund the project via its regulated allowance and/or the DMIS as applicable.
Whether the trial project may negatively impact AEMO's operation of the national energy systems and national energy markets or AEMO's facilitation of customer connection services and customer retail services and, if there are impacts, how those impacts can be mitigated	The project will not adversely impact AEMO's operations.
Whether the trial project may impact on competition	The project will not adversely impact competition, all retailers will be able to participate.

in a competitive sector of a national energy market	

Additional Principles

Whether the trial project is able to be trialled and evaluated	The project has been trialled and evaluated through the Albion Park trial which was conducted prior to the existence of the Regulatory Sandbox reforms. This expansion of the trial allows us to test this solution in addressing other network constraints and evaluate it further.
Whether there is potential for the trial project to be successfully expanded	This is the expansion of the trial to additional locations. We believe the trial has the potential to be applied more broadly across our network as a ow marginal cost approach to improving hosting capacity. It could also be extended into the future to provide cost effective access to electric vehicle charging.
Whether the trial project will provide for public sharing of knowledge, information and data resulting from the trial project.	Yes, a final project report can be provided. Noting that reporting under the DMIS may also address this information sharing requirement (if we were to apply for an incentive under the DMIS).

Attachment B – Supplementary Information

Audio Frequency Injection Control (AFIC) Equipment – Evaluation of Benefits

Evaluation of Benefits

Prepared by Asset Planning and Performance
March 2023

Endeavour Energy

Version control

Audio Frequency Injection Control Replacement – Evaluation of Benefits– Capex Program

Version	Date	Comments
1	March 2023	Initial issue

Contents

1. Executive Summary

Load control schemes offer significant benefits to customers, retailers, network operators and generators. AFIC load control equipment has historically been used by Endeavour Energy to facilitate its load control program and offer customers cheaper savings through Controlled Load tariffs. As discussed in this document, adopting a strategy of turning the AFIC system off and removing controlled load tariffs off will cost controlled load customers $276 per customer per annum on average in higher energy charges.

Alternatively, retaining controlled load tariffs but not using the control scheme will cost the network operator and retailer approximately $249 per controlled load customer per annum. Maintaining the controlled load tariff and using the scheme to achieve load control offers market benefits that outweigh the costs of running the scheme. The existing AFIC technology enables a load control scheme, mainly off-peak hot water, that benefits customers, retailers, generators and network services providers financially.

Customer benefits are primarily access to lower hot water heating costs. Retailer benefits lie in the ability to secure and purchase energy at a much cheaper off-peak rate than would otherwise be required. Generator benefits lie in the ability to secure sufficient load to make baseload generating plant feasible, and specifically to shift load at specific times. As generator costs are reflected in spot market prices, generator benefits have not specifically been quantified in this document. Network Service Provider benefits arise from the ability to better control and manage loads to avoid costly network augmentation.

Smart meters can achieve the same objective as well as provide other benefits not achievable through the legacy AFIC technology. The rapid take up of rooftop solar is also driving a churn towards smart meters. With the churn towards smart meters, the population of customers requiring AFIC signals to run the load control program is declining, to a point where for a given location, continued use of AFIC technology to provide load control services becomes uneconomic at some point. As AFIC equipment replacement needs approach, against declining need, it becomes necessary to evaluate if a like for like replacement strategy, and continued investment in AFIC technology, is prudent.

This Case for Investment recommends investment in costs associated with a program for targeted replacement of audio frequency injection control (AFIC) equipment across eligible Endeavour Energy substations. Locations that are eligible for a smart meter replacement strategy must meet one or more of the following criteria.

- Natural smart meter churn and reducing numbers of customers requiring AFIC signals
- AFIC cells reaching end of life
- Upgrade of AFIC capacity – additional cells required
- Higher benefit uses of space in zone substations
- Operational issues associated with supplying areas with and without AFIC
- AFICs required for new zone substation to sustain existing customers
- Power Quality issues arising from AFIC signals

The locations that fall within these criteria has been categorised as follows:

Category 1 sites where a conversion strategy will feed an essential spares program. These sites need no other trigger other than to maintain a certain number of spare units, provisionally selected at 5. The intention is to convert the first five sites and then trigger any remaining sites as spares are used up.

Category 2 sites with ageing assets that may need to be replaced. A number of these sites may need to be managed with the essential spares program. Some proactive smart meter replacements may be carried

out through the DMIS scheme. Sites which meet DMIS criteria may be selected from this list for a smart meter rollout.

Category 3 sites are locations where substation space requirements triggers require the removal of AFIC equipment from this location. Typical triggers for this category might be the establishment of a new distribution feeder bay for a new feeder; or space to locate higher priority equipment such as batteries or VAr control equipment.

Category 4 sites are locations where power quality issues and complaints cannot be technically or cost effectively managed and which a smart meter rollout would address.

In addition to enabling present load control benefits, a smart meter replacement strategy also has the ability to enable additional benefits, such as demand response aggregation and demand management programs through the use of newer technology and communications. Based on presently known costs and a conservative estimate of additional benefits, these additional benefits will almost always make a smart meter replacement strategy more attractive. Demand management incentives have only been nominally quantified based on established trials conducted by Endeavour Energy. This is mainly pertaining to air-conditioning control. This is considered sufficient for the purpose of this business case. There are other products that have recently been trialled by Endeavour Energy, such as Off Peak plus. Such DM programs run in association with a smart meter replacement program have the potential to attract DMIS funding, as has been the case at Albion Park. While this case for investment is concerned with the replacement and longevity of AFIC systems to deliver traditional load control services, the application of DMIS funding to enable other innovative Demand Management solutions should be explored as candidate sites are selected for investment. As DMIS funding depends on the nature of innovations that are yet to be fully explored, it has not been further quantified in this case for investment. However, where applicable, Category 2 sites should be considered for DMIS funding.

This document takes into account prevailing churn rates to smart meters and recognises that with this conversion, AFIC technology will eventually become obsolete. Any recommendation to proceed with AFIC replacement for a given site is made on the basis that the option addressing the issues represent the highest value (economic benefit) to the market.

2. Purpose

This document describes the evaluation of benefits of a program of investment designed to proactively replace the AFIC systems within nominated zone substation sites that are impacted by the capex program and will intervention with regards to AFIC cells, either due to space requirements or a need for intervention to manage older AFIC sites in conjunction with new zone substations being established nearby.

3. Need/opportunity to be addressed

3.1 Background

Controlled load hot water heating tariffs are in widespread use throughout Australia and have been offered to customers in NSW for approximately 60 years with its origins going back to the Electricity Commission of NSW and the original local government owned electricity suppliers.

Whilst it is facilitated by network service providers, it presently provides market and non-market benefits across the energy supply chain. With modifications, as the energy supply landscape changes, there are also opportunities to modify the original design of the controlled load tariff scheme to provide yet further benefits.

For current market participants, starting with customers, the scheme provides the following benefits:

Customer Benefits:

- Access to the low rates via controlled load tariffs NUOS compared to what would be charged under residential flat, seasonal, demand NUOS rates. The controlled load tariff service offers customers a low-cost option for their electric hot water heating. A low cost hot water service is important lifeline in colder winter months especially where other alternatives, such as gas, may not be available or may be too expensive to achieve.
- Avoid the need for the customer to control the appliance themselves or the costly appliance changeover to gas or solar options.
- A potential future benefit of the scheme is to provide a solar soak for customers with PV to allocate their excess solar generation during the day time to heat water in the tank. This is beneficial for the customer in comparison to buyback rates for day time PV generation (even after consideration of thermal losses in the tank).
- There is also potential to assist in the LV network absorption of excess PV generation during high solar days and low load periods, that is, assist in the evaluation of solar hosting capacity.

Network service provider benefits:

- Peak demand reduction and ability to control the large demand of hot water heating at a zone substation level to help defer or avoid network augmentation. It provides the opportunity to better manage loads and minimise investments in augmentation of infrastructure.
- Provide a control mechanism to support restoration following fault and emergencies to avoid high demands occurring immediately after network restoration
- Provide a shed-able load to a DNSP that is not possible with instantaneous electric hot water heating.
- Provide a minimum load overnight for LV network stability in terms of voltage levels, particularly the resistive load of water heating. (This benefit is also available for the wider transmission network).

Generators benefits are as follows:

- provide base load overnight and stable energy profiles for dispatch, the primary benefit has been to facilitate better load management by providing a more stable base load and enough load to keep baseload generating plants in operation.

Retailers:

- the principal benefit has been to avoid high spot market prices at times of peak,
- better predictability of load
- reduced losses through a reduction in peak loads.

Market Operator Benefits:

- Provide minimum loads overnight for system stability with resistive load helping system strength with a resistive load for base load generation.
- Demand Side Participation controlled load available for demand side participation in the energy market.
- Load shedding control availability in the case of system emergencies.

There are some non-market benefits that also arise from delivery of load control services, particularly for hot water heating. These are outlined below.

Non-Market Benefits:

- In terms of non-market benefits, the primary benefit has been a reduction in greenhouse gases through reduced network losses because of shifting loads from peak times to off peak times.

Controlled load off peak hot water heating has been a very effective demand management product in NSW in terms of benefits to customers through much lower cost of energy. Retailers have been able to offer low prices due to lower bulk supply tariffs from generators who have been able to effectively utilise base load generation capacity. It has also enabled effective capacity management in the network particularly during the period when the network was predominantly winter peaking and uncontrolled hot water heating would strongly contribute to peak demand on the distribution system. With summer peak demand network this benefit has diminished however it is still significant at a local area level within distribution networks.

Most of new hot water services being installed now are gas instantaneous heating. However, during the 1960s and 70s almost all hot water heaters were electric storage prior to widespread gas distribution in Sydney and Wollongong areas. Solar thermal hot water services have also grown in that time.

It is anticipated that even with changes in technology and increasing levels of distributed generation, some form of load control services will remain relevant in the future energy supply landscape. The question is whether the current technology used to deliver this service remains relevant in the future energy supply landscape or whether technological advances can be used to replace and further enhance the delivery of this service.

Whist AFIC technology currently remains relevant and continues to provide the benefits above, the benefits stack is changing as the technological landscape changes. Power of choice initiatives suggest that the industry is on a trajectory where smart meters will eventually dominate the fleet of energy meters in use. Smart meters can deliver a load control service and provide other benefits as well. Hence as smart meter penetration increases, the reliance on AFIC technology diminishes to the point where AFIC technology will become redundant in future.

Audio frequency injection control (AFIC) systems are used to inject an additional audio frequency signal into the power lines that deliver power to homes. This audio frequency signal is used to trigger relays installed in customer meter boxes. The loads within customer premises that are connected to these relays can then be turned on or off by the network service provider through the use of the AFIC system. While

- customers are able to benefit through access to lower tariffs, the use of this system allows Network Service Providers to better manage load, and retailers to better manage wholesale supply costs.

The installed audio frequency injection control (AFIC) systems installed within Endeavour Energy zone substations (and some transmission substations) are used to control 400/230V loads primarily, off-peak 1 and 2 electric hot water storage systems. Approximately 350,000 customers or roughly 35 percent of the customer base currently access controlled load network pricing options.

Controlled Load 1 and Controlled Load 2 options are only available to connection points using a Residential or General Supply pricing option. Currently there are 347,000 customers that are on off peak tariffs. Of these 240,000 are on Controlled Load 1 tariff and 107,000 are on Controlled Load 2. Customers on these tariffs are not exclusively limited to the catchment areas of the substations listed in Annexure 2 as some newer areas use alternative technologies to implement these pricing schemes.

With the Controlled Load 1 tariff, supply is not available between the hours of 7am and 10pm during both Eastern Standard Time (EST) and Daylight-Saving Time (DST). Supply is made available for selected periods between 10pm and 7am (EST and DST). Provided conditions (such as a permanently connected fixed wiring to appliances) are met, supply on this tariff can be extended to appliances other than just hot water tanks. Such additional uses can include swimming pool pumps, pool heating equipment, dishwashers, clothes dryers, washing machines, thermal storage, space heaters, under floor heating, ice storage systems and electric vehicle charges.

With Controlled Load 2 pricing, supply can be restricted to a maximum period of 17 hours in any period of 24 hours. Apart from the changes in times when supply is made available, the same conditions apply as for Controlled Load 1 pricing with some exceptions related to hot water appliances.

Apart from using the AFIC systems to initiate load control on customer premises, Endeavour Energy also uses the AFIC systems to trigger streetlighting controls in some areas.

The AFIC signals are injected at frequencies of 283, 396, 750 or 1050 Hz at the zone substation. Generally, the frequency signals are injected into the 11kV (or 22kV) bar, with the exception of the Transmission substation sites where the signals are injected into the 33kV system. The signals are typically injected 5 to 6 volts to correctly operate the receiving relays. As the signals are injected into distribution lines that cater for servicing of load, the AFIC equipment must be sized to have sufficient capacity to overcome the impedance of the downstream network being supplied out of a zone substation. Thermal tripping of AFIC cells is a problem that occurs when the load and particularly the downstream network has changed considerably from what the AFIC systems were originally sized for.

There are currently 143 Sites with AFIC equipment within Endeavour Energy. Of these two are transmission substation sites (Shoalhaven TS and West Tomerong TS). Annexure 2 has a listing of sites with AFIC equipment. This listing is derived from the Scada database and is indicative only for the purposes of this CFI.

The existing fleet of AFIC equipment hence has different capacities. Hence there are design complexities that need to be accounted for in ensuring that AFIC signals reach all the customers that it is intended for, and at the same time ensure no overloading occurs.

There are two different technologies associated with AFIC equipment. The earlier technology involves the use of a motor generation (MG) unit as depicted in the figure below, and an associated frequency cell

connected by appropriately sized cables between the MG set and the distribution busbar section. More recent technology involves the use of power electronics technology and in place of an MG set a steady state unit is utilised. An SFU installation is depicted on the front cover of this document.

Figure 1 - AFIC MG (Motor Generator) set

In order to permit split busbar operation, two or more AFIC units are usually required in a substation. Some locations such as Penrith 11kV zone substation have only one AFIC system installed and this imposes operational constraints in being able to operate the 11kV busbar system in split mode.

This case for investment addresses whether a simple like for like replacement is appropriate given further advances in load control technology, particularly with advances in metering technology that is installed on customer premises. Furthermore, with the increase in penetration of emerging technologies such as PV, batteries and EV charging, consumer load profiles are changing and there is an emerging need to shift load to the middle of the day when PV generation on the customer side is highest.

3.2 Need/Opportunity

Increasing smart meter penetration will eventually take over delivery of load control services from AFIC technology.

The use of the AFIC technology at Endeavour Energy is widespread and whilst a strategy of replacement of the entire fleet with smart meter technology could deliver additional benefits, it remains uneconomic to undertake a wholesale replacement, unless future innovation with smart meters provide significant

additional benefits. However, recent experience has indicated that alternative delivery methods have been shown to be more cost effective compared to a traditional AFIC only solution. It is therefore appropriate to investigate alternative schemes when certain criteria are met.

While several triggers are discussed below, this case for investment relates only to sites that are impacted by the capex program, that where assets need to be augmented to cater for increasing demand and growth in new connections.

The triggers for investment for this class of assets are as follows:

- AFIC customers on a zone substation have dropped below an economic threshold and smart meter conversion is a more effective and economic means of providing the service.
- End of life – AFIC assets reach end of life and hence need for replacement pre or post failure
- Upgrade or additional AFIC unit required due to load growth and overloading of AFIC systems, or if the AFIC unit imposes operational constraints.
- Higher benefit use for connection at zone substation – when a circuit breaker needs to be freed up to allow connection of additional feeders servicing customers. A higher benefit use of the space occupied by the AFIC unit
- New Zone substations – new assets to be installed in new zone substations; the new zone substation may also feed into existing fringe areas that have AFIC initiated signalling.
- Power Quality issues arise as a result of AFIC operation.

The need for investment also provides the opportunity to harness and capture additional benefits, particularly with the adoption of a smart meter strategy. Some of these additional benefits and opportunities are described below:

- Access to smart meter data for better decision making
- Customer can use to store excess energy from PV
- Enables voltage optimisation schemes
- Safety – open circuit neutral detection and consac cable condition assessment.
- Lower Capital Cost: the Smart Meter is lower cost than a like-for-like replacement of existing AFIC units based on recent results. i.e. the payment of a financial incentive to facilitate meter changes compared to network equipment replacement.
- Lower Operating Cost: the smart meter option should have lower on-going operating cost compared to the AFIC, particularly an aged AFIC unit prone to failure due to the maintenance requirement of AFIC units and call outs required for failure and cold-water complaints.
- Reduced Cross-subsidy and Stranded Assets: Due to the BASIX building approval process, almost all new water heating is based on gas and as smart meter penetration increases there is a lower need for the existing AFIC load control units. This is resulting in potentially few customers receiving the benefits of the AFIC units and a fixed cost base to install and maintain the units. When all customers are on gas or have churned to smart meters, there will be no need to retain the AFIC load control equipment.
- Enhancing innovation and improving collaboration between retailers, DNSPs and meter providers in the spirit of the Power of Choice. The smart meter option makes enhanced services available for the customer. These include PV solar soaking absorption and EV charging, using the advanced control capability of the meters. Both of these aspects have benefits to DNSPs in terms of capacity planning.

- Enhanced metrology and customer data to support more efficient pricing and customer benefits for potentially lower prices and more cost reflective network prices due to the enhanced metering capability capturing half hourly data.
- Possible safety improvement in monitoring neutral integrity via the smart meter.
- LV system monitoring capability available via the smart meter. Customer point voltage level can be monitored
- Enhanced customer connection point data and usage data to improve network planning.

3.3 Forecasts

This section addresses the likely need for AFIC cells to be replaced or installed in the future in order to assess the opportunities that become available to utilise alternative technologies to achieve load control. Broadly, the strategy involves:

a) AFIC assets requiring augmentation as a result of operational constraints and/or exceeding thermal limits
b) AFIC assets requiring removal due to provide higher use benefits for the space taken up within the substation and 11/22kV switchboard.
c) Boundaries between zone substations where one zone has AFIC and another does not.
d) A need for load control technology for new substations being installed in the fringes of existing areas with AFIC penetration.

These elements are discussed below.

3.3.1 Requirement for thermal Upgrades and/or Additional units due to inadequate capacity or operational constraints

The following chart presents a snapshot of AFIC/Network related cold-water complaints since about 2017. The chart displays the only the substations with 10 or more callouts during this period.

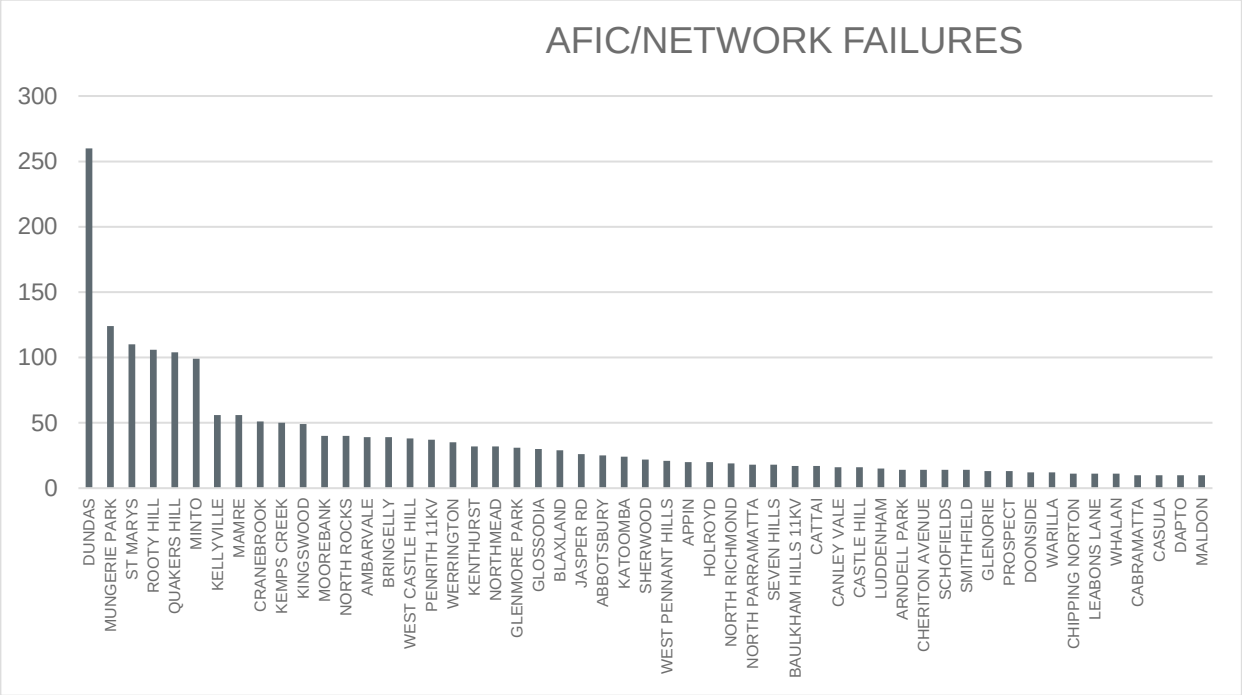


Figure 2 - AFIC and Network related callouts since 2017

The following is a prioritised list of zone substations where the number of available AFIC cells imposes operational constraints. The list has been developed in consultation with network control. Issues raised with regard to operational constraints are as follows.

When AFIC units are decommissioned, and smart meters are not installed throughout the service area, re-arranging the distribution network is constrained for planned and un-planned works as some customers may not receive the signals either due to signal attenuation or due to being supplied from a part of the network which does not normally have an AFIC signal. For example, with the constrained north west sector, Mungerie Park zone substation has no AFIC, and when rearranging the network with ZS ties to Parklea, South Windsor, Kellyville, Kenthurst etc.) operators have to be aware to avoid feeding these areas from Mungerie Park. With extended outages this becomes a problem with utilising existing assets due to AFIC incompatibility.

For substations where there is only one AFIC system available, during hot day operations, where split bus operation is required, one or more sections of the 11kV busbar is left without an AFIC signal which means that switching is required each time an AFIC signal is required (several times during a day) to make the bar solid, run the AFIC signals and then split the bar again. This causes significant workload burden in the control room on what are already busy hot day periods. Minimising switching operations also reduces the duty cycle of switchgear which are required to interrupt and make high load currents on a hot day.

Table 4 lists the locations where zone substations have fewer AFIC cells than the number of 11kV bus sections. Assuming 20 of these zone substations require split bus operations on 20 days during the year, and that splitting the bus and running the AFIC signal takes 15 minutes to complete each time, with a total of four operations each day, on a busy hot day in the control room, for 20 of these zone substations, a

- valuable 20 person-hours is being spent on managing these AFIC constraints. The annual estimated cost of $25,000 (or about $185 per AFIC ZS per annum or $0.07 per AFIC customer) does not accurately reflect the value of freeing up constrained resources during a busy time in the control room.

  Overall, when considering a replacement strategy, the number of customers affected by the backup needs to be also factored into the solution when assessing the number of customers that need to be changed over to smart meter technology. However, an easier alternative, where this is possible, is to isolate AFIC equipment being replaced but to leave it in situ in the zone substation until all affected adjacent zone substations are converted to smart meter control. Where larger scale meter replacement in the adjacent zone substation catchment is considered infeasible, this strategy should be employed if the lower scale of replacement is cost effective.

Table 1 - AFIC locations with potential operational constraints

ZS with 3 Trfs but 1 AFIC	ZS with 3 Trfs and 2 AFICs	ZS with 2 Trfs and 1 AFIC
Castle Hill	Albion Park (being addressed)	Bossley Park
Moorebank	ANZAC Village	Bringelly
Seven Hills	Bonnyrigg	Cabramatta
	Canley Vale	Cambridge Park
	Casula	Carramar
	Claremont Meadows	Cattai
	Cranebrook	Glossodia
	Dapto	Greystanes
	Emu Plains	Hazelbrook
	Hinchinbrook	Katoomba
	Holroyd	Kenthurst
	Homepride	Kiama
	Jasper Road	Kurrajong
	Kingswood	Lithgow
	Lennox	Luddenham
	Liverpool	Macquarie Fields
	Marayong	North Richmond
	Narellan	Oakdale
	Newton	Penrith
	Parklea	Riverstone
	Plumpton	Woodpark
	Prestons	Yennora
	Prospect	
	Quakers Hill	
	Rosehill	
	Shellharbour	
	Smithfield	
	South Windsor	
	St Marys	
	Werrington	
	Whalan	
Total Count (3)	Total Count (31)	Total Count (22)

3.3.2 Higher Benefit Uses for space

The chart below is a high-level indication of which zone substations that have AFIC and no spare 11/22kV circuit breakers and hence could be constrained for circuit-breaker space on the 11kV switchboard. There are 61 zone substations where this is or might become an issue in the future. Also included are locations

which have no spare circuit-breakers and no current double-cabling. No current double cabling is included as double-cabling is not suited to all locations and it is beyond the scope of this document to further investigate this.

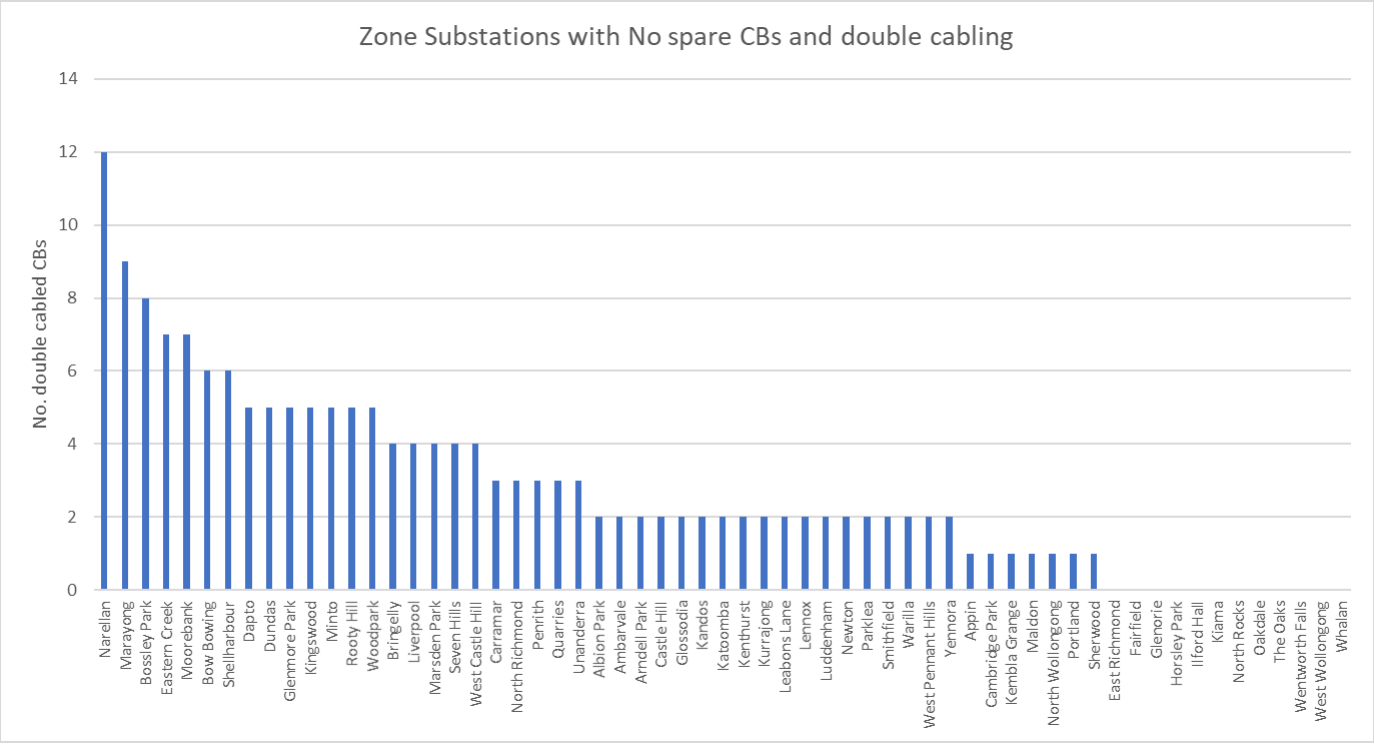


Figure 3 - Zone substations with AFIC and no spare CBs and double cabling

3.3.3 Zone substation boundary issues

There are some areas within the Endeavour Energy franchise which have a zone substation with no AFIC but relies on AFIC signals from an adjacent zone substation to service a small number of legacy load control customers within the catchment area of a zone substation with no AFIC assets.

The following are examples of this where this occurs.

Table 2 - Examples of Zone substations with no AFIC equipment but AFIC customers in catchment

ZS with AFIC	Non AFIC ZS	CL customers in Non AFIC ZS catchment relying on AFIC Signal	AFIC ZS CL Customers
North Wollongong	South Wollongong	971	880
North Wollongong	Kenny Street	160	
Marsden Park	South Marsden Park	75	116
Bringelly/Luddenham	North Warragamba	1712	
Bringelly/Luddenham	South Leppington	248	1282/703

3.3.4 New Zone Substations

The Portfolio Investment Plan (PIP) outlines approximately forty major projects over the ten year period that may require consideration of an alternate load control strategy. The graph below indicates the approximate number of present day existing controlled load customers that may be impacted by PIP projects over the next ten years. Note that in some cases, the same customers may be affected by more than one project.

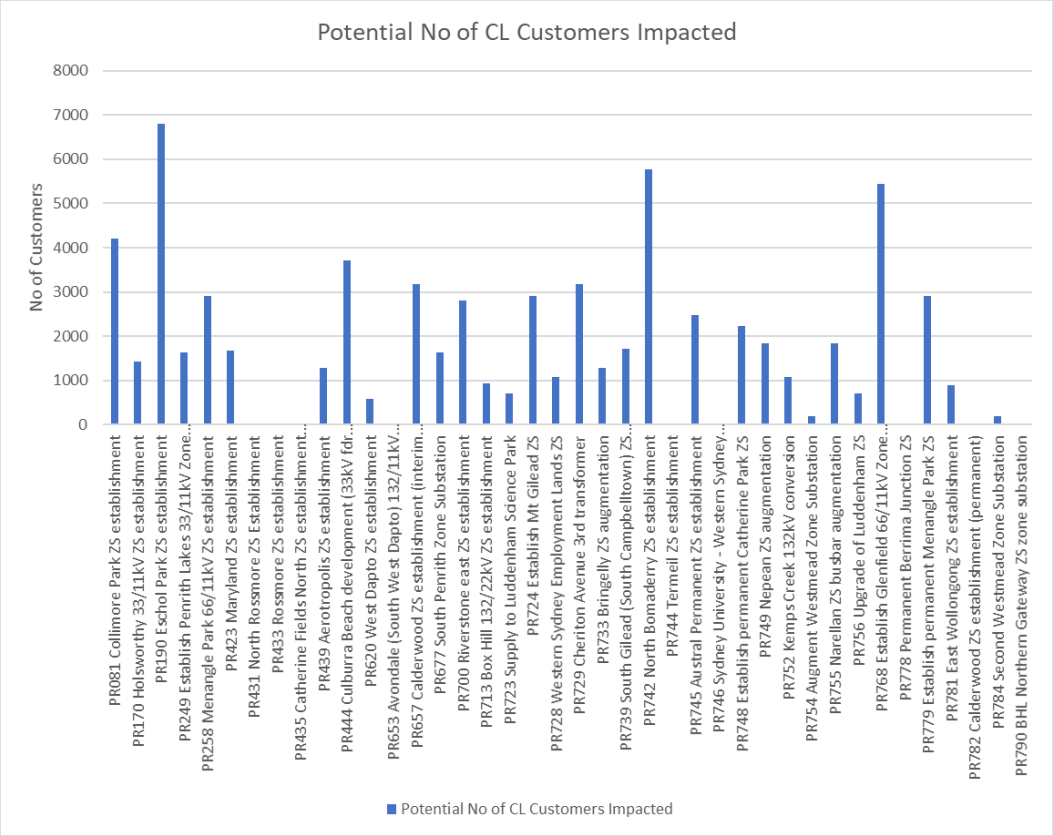


Figure 4 - Potential number of AFIC customers affected from new major projects

All of the substations with AFIC bays nearing end of life will be impacted by one or more major project and will require some form of alternate load control strategy to cater for customers in adjacent areas that are currently supplied from an AFIC substation. In addition to the bays nearing end of life, the following list of zone substations will also be impacted.

Table 3 - List of Zone substations impacted by the major projects that may not be approaching end of life

Additional zone substations impacted by the PIP program
Anzac Village
Berrima Junction
Bomaderry
Campbelltown

Cheriton Avenue
Culburra
Hinchinbrook
Kembla Grange
Kemps Creek
Mungerie Park
Narellan
Nepean 11kV
North Leppington
North Wollongong
Oran Park
Prestons
Schofields
Westmead

3.3.5 Impacts of Smart meter churn

The biggest driver for the churn to smart meters, failing government intervention, by far will be customers' adoption of rooftop solar PV. Solar PV penetration in Endeavour Energy's areas is predicted to grow from 19.2% in 2021 to 31.8% by 2026. Smart meter penetration in Endeavour's area will grow by at least the same amount.

3.4 Consequence of 'no proactive intervention'

A fundamental regulatory principle that applies to capital investments associated with Endeavour Energy's provision of standard control services is that market benefits must exceed the cost of providing these services, unless the investment is made for reliability corrective actions. Once this is satisfied further optimisation may take place between options to address company benefits.

Under a 'no proactive intervention' scenario, this CFI documents why it is still justifiable to maintain a controlled load scheme operating as opposed to turning the whole scheme off as AFIC units fail.

Although the level of investment in this scheme does not meet the required threshold for the Regulatory Investment Test for Distribution (RIT-D), a similar approach and framework has been applied.

The risk costs that affect the outcomes of the Case for Investment, in accordance with the National Electricity Rules are as follows:

Risk Costs

- Reliability and security risk costs
- Safety and health risk costs
- Environmental risk costs
- Legal and regulatory compliance risks

- Financial Risks

NER Market Benefit Risks

- Involuntary Load Shedding
- Voluntary Load Curtailment
- Difference in timing of unrelated expenditure
- Costs incurred by third party market participants
- Electrical Energy losses
- Change in load transfer capacity and the capacity to host embedded generation
- Other classes of market benefit approved by the AER (none approved by the AER to date)

A number of risk costs and benefits, such as safety and health risk costs, environmental risk costs, and electrical energy losses are potentially too remote to the objectives of this program and difficult to evaluate on a program level, and potentially not material.

All relevant benefits that could be considered non-market benefits are able to be captured as risk costs to market participants. Hence, there are no other non-market benefits that have been considered.

The dominant risk category that this CFI is based on is financial risks to market participants.

As this is a generic document that could be applied to several projects, a per customer approach has been applied.

One view for no proactive intervention involves a business as usual like for like replacement strategy as units are retired. The disadvantage of this is that as smart meter penetration increases across the Endeavour Franchise area, the utilisation of AFIC asset will continually decline to a point where operation of AFIC assets for the small number of remaining customers becomes uneconomic, and controlled load tariffs are gradually withdrawn from the system. Notably, the increasing penetration of residential rooftop solar is also a driver for increasing penetration of smart meters.

An alternative view for the base no proactive intervention case is that as individual AFIC units reach end of life, no replacements are undertaken, and appliances connected to off peak load control devices are switched permanently on for the entire 24-hour period at a significantly discounted controlled load tariff.

Costs have been evaluated in consideration of these two schools of thought.

<u>Retailer and DNSP Losses if controlled load channels turned permanently on.</u>

Retailer loss has been calculated as the difference in energy costs to retailers if the controlled load channels were to be left permanently on. Based on a typical day's peak and off-peak spot market prices in NSW, there is a differential of 16 cents per kWh that is available to retailers in terms of differences in purchasing costs. The average controlled load energy used by each controlled load customer has been evaluated as 2,445 kWh per year. Revenue from customers based on a flat energy tariff would apply to the controlled load energy, and assuming no incentive to use energy at off peak times, would result in a retailer loss of about $55 per customer per annum.

The DNSP loss has been evaluated as the difference in revenue between controlled load energy being used at peak times but charged a flat rate and applying the annual controlled load energy at off peak DNSP tariffs. This represents energy being used by the customer at all times but being charged a much lower controlled load tariff for this energy.

The following table illustrates the average per customer losses attributable to market participants if the load control elements were to be turned permanently on and the same controlled load tariffs were to apply to the energy consumed. The cost of customer losses has not been included in the total losses as the calculation assumes that the customer does not pay any more if the load control elements were to be turned permanently on.

Table 4 - Market costs for Turning CL relays permanently on

Description	$ Value	units
Generator Impact/Loss	Not quantified	
Retailer Loss	$55.00	Per customer per annum
Endeavour Loss	$194.00	Per customer per annum
Total Losses	**$249.00**	**Per customer per annum**

Increased customer costs if CL tariffs withdrawn

Alternatively, the no proactive action case could mean the gradual withdrawal of controlled load tariffs from the system. As tariffs generally get approved within the cycle of a regulatory determination (5 years) it will be some time before this can be implemented. In this unlikely event, the cost to the average customer would be $276 per annum, based on the difference in energy costs for the same energy using a basic retail tariff and present day retail controlled load tariffs. This represents the present average savings to controlled load customers running a storage hot water system. This is the value customers obtain from having access to a controlled load tariff.

From a market participant (customer) point of view the no proactive intervention case could also mean that customers are left without access to hot water as AFIC cells are retired. Potentially this means that customers would then be faced with an additional cost to replace their electric storage hot water unit with an alternative technology. This cost has been valued at $2000 per customer as a one-off cost, with 50% of this cost being purchase of a new unit and the remaining cost being modifications required in the house to adapt to new technology.

The gradual removal of the scheme would mean that customers are not able to take advantage of lower off- peak rates to achieve the same hot water service. Hot water would then be available at the prevailing electricity tariff rates. This is a financial risk for the customer

Maintaining the load control scheme allows customers to permit the network service provider to control some select appliances such as hot water tanks in exchange for a lower tariff for these appliances. Gradually removing the load control scheme by no proactive action means that this scheme of voluntary load curtailment during peak hours would no longer be available to these customers.

Table 5 - Customer losses from not having access to CL tariffs

Description	$ Value	units
Customer losses from not having access to CL tariffs	$276	Per customer per annum
Total Losses	**$276.00**	**Per customer per annum**

Network Investment – capital vs ongoing OPEX Risk costs

One element of opex costs associated with AFIC equipment are the costs to operate and maintain the equipment installed within the substation.

A second element of continuing to operate this technology is to address customer cold water complaints when the equipment does not operate as expected. This may mean that a district operator visits the zone substation to check on the status of the AFIC equipment. It may also mean field personnel callouts to customer premises to check correct operation of the relays within customer switchboards. It also involves call centre customer service staff. This element concerns customers who are directly using the AFIC technology

A third element of opex risk costs is related to power quality complaints from customers who may not be using the AFIC enabled off peak rates. A known phenomenon is that customers with LED lighting installed within their premises experience flicker problems from AFIC signals.

4. Options Analysis

Apart from the no pro-active intervention base case of no investment at all, the proposed methods to address the financial risk are:

- Option 1 – Replace AFIC system on a like for like basis.
- Option 2 – Convert Controlled load relays to time switches.
- Option 3 – Convert Controlled load relay installations to smart meters

The benefits of retaining the controlled load scheme has been discussed in the previous section and therefore it is only the risk costs that differentiate the three options below that are considered in the section below.

4.1 Option 1

For Option 1, the proposal is to upgrade and replace the AFIC system at the subject zone substation sites when the opportunity arises. This requires replacement of the MG sets, injection cells, and all associated HV and LV cabling to cater for a correctly sized AFIC system to match the load. Based on recent experience, the approximate cost of this based on a 2 cell site is approximately $780,000. The option of like for like replacement carries with it the risks associated with diminishing number of customers with electric storage hot water systems due to stringent BASIX requirements, and therefore decreasing utilisation of AFIC technology with time.

Based on work done for AFIC replacement at Albion Park Zone Substation, the estimated cost of the upgraded AFIC system is $780,000. The average number of controlled load customer per zone substation in 2021 is 2120. Based on a technical life of 45 years, the average cost per controlled load customer for an AFIC cell installation is **$368.** Operations and maintenance cost for the AFIC system has been calculated as $1.33 per AFIC CL Customer. It has been assumed that the majority of maintenance costs being spent in each year is being spent on the fifty AFIC units that are nearing end of life.

Table 6 - AFIC Capex and Opex Costs

Description	$ Value	units
Cost to replace AFIC (capital cost)	$ 368	Per AFIC CL customer
Opex costs per customer	$1.33	Per AFIC CL customer per annum

4.2 Option 2

With Option 2, controlled load relays on customer switchboards will be converted to time switches. Based on previous experience, the cost per customer to convert to time switches is $290 per customer. Operations and maintenance costs have been estimated as 0.4% of capital cost per annum. This evaluates to $1.16 per CL customer per year.

This option does not provide as much functionality as the smart meter option. There is no centralised control to enable future demand aggregation services, for example.

Table 7 - Time Clocks Capex and Opex Costs

Description	$ Value	units

Cost to replace AFIC (capital cost)	$ 290	Per AFIC CL customer
Opex costs per customer	$1.16	Per AFIC CL customer per annum

4.3 Option 3

Option 3 involves the conversion of controlled load relay installations to smart meters. Conversion of basic meters to smart meters will gradually occur with customers across the franchise. When this occurs, AFIC technology will become redundant as a means to effect load control at customer premises.

This option becomes attractive when conversion of customers to smart meters within a substation catchment is more cost effective compared to replacing or installing one or more AFIC units. This option may not be cost effective in all cases. Using a per customer approach enables a quick decision to be made about whether this option is cost effective in a particular case. This suggests a there is a theoretical maximum number of customers at a particular site before smart meter conversion becomes unattractive.

A significant issue with the smart meter option is that currently, metering assets are owned by a meter provider. Existing basic meters can be changed over at the request and cost of retailers. A Distribution Network Service Provider may only make a change of meter request if they believe the metering assets to be faulty or unserviceable.

The cost of this option depends on the negotiated value of contributions made to third party market participants (retailers or meter providers) for the conversion of standard meter premises to smart meter premises. In some jurisdictions, there may be other drivers for smart meter conversion which will bring the costs for this objective down. Some retailers may be willing to absorb meter conversion costs as they will derive other benefits.

With smart meters additional flow on benefits arise and these can be taken into account when determining if this option is cost effective.

For option 3 to work, Endeavour Energy has to ensure that all customers who are on a load control tariff are changed over to smart meters or a suitable alternative. The cost implications for Endeavour with this option is that a contribution be made towards the cost of replacing the meters. This is intended to take the form of possibly a small operating expenditure cost component as well as a capital expenditure cost component to cover the additional cost of hardware to be installed within the meters. An alternative view is that the meter replacement is seen as ‘enabling works’ in some locations and is therefore capex in nature.

The use of smart meters would also enable additional benefits to be realised. The smart meter platform can also serve as an interface hub for:

- Air-conditioning control through Demand Response Enabled Devices (DREDs)
- PV inverter control through Virtual Power Plant (VPP) response (in lieu of a third party box on the customers’ walls)
- Enabling smart solar PV grid hosting capabilities by DNSPs

Additional retailer benefits pertaining to market arbitrage over and above hot water load control and on the basis of air-conditioning control with 25% participation amongst controlled load customers and 4 control events per year on average, has been evaluated to be $62 per controlled load customer per annum. This is in addition to the $55 per customer benefit accruing to retailers on account of hot water load control. On

the same basis, additional DNSP benefits over and above hot water control has been estimated as $17 per controlled load customer per year on the basis of reduction in peak demand.

The total cost of decommissioning the AFIC system and conversion of relays to smart meters or smart load control devices, based on the Albion Park experience, is $120 per customer. This is on the basis of incentive payments made to retailers to offset the cost of meter replacements. Endeavour Energy's operations and maintenance costs associated with running the various schemes via the smart meters is estimated at 0.4% of the capital cost contribution from Endeavour or $0.48 per AFIC CL customer.

Based on the cost of an AFIC cell, and the cost to replace and AFIC unit ($780,000) and the smart meter contribution of $120, it follows that the approximately 6500 CL customers can be replaced for the cost of an AFIC replacement. For zone substations with less than 6500 CL customers, replacement of AFIC technology with smart meters should be considered economic.

A significant barrier that this option needs to overcome is that not all customers are agreeable to have their basic meters changed over to smart meters. For those customers that object to changing their meters over, the time clock solution of Option 2 needs to be adopted on a small scale. This will impact on viability of the scheme as the time-clock option is costlier than the smart meter option. Hence this will impact on the number of conversions considered to be economically effective for a particular site.

Table 8 - Smart Meter conversions - Capex and Opex costs

Description	$ Value	units
Smart meter contribution (capital cost)	$ 120	Per AFIC CL customer
Opex costs per customer	$0.48	Per AFIC CL customer per annum

4.4 Risk Cost Benefits

Risk cost and benefits for each option are tabulated below.

Table 9 - Risk costs per AFIC customer - no proactive action for a single zone substation where AFIC is not replaced.

	Resulting Annual Risk costs ($ nominal)										
Year	**FY21**	**FY22**	**FY23**	**FY24**	**FY25**	**FY26**	**FY27**	**FY28**	**FY20**	**FY30**	**FY31**
Capital Cost	0										
O&M Cost		0	0	0	0	0	0	0	0	0	0
Customer Benefits		-276	-276	-276	-276	-276	-276	-276	-276	-276	-276
Generator Benefits											
Retailer Benefits		-55	-55	-55	-55	-55	-55	-55	-55	-55	-55
DNSP Benefits		-194	-194	-194	-194	-194	-194	-194	-194	-194	-194

Table 10 – Option 1 Risk costs (per customer)

	Resulting Annual Risk costs ($ nominal)										
Year	**FY21**	**FY22**	**FY23**	**FY24**	**FY25**	**FY26**	**FY27**	**FY28**	**FY20**	**FY30**	**FY31**
Capital Cost	368										
O&M Cost		1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
Customer Benefits		276	276	276	276	276	276	276	276	276	276

Generator Benefits											
Retailer Benefits		55	55	55	55	55	55	55	55	55	55
DNSP Benefits		194	194	194	194	194	194	194	194	194	194

Table 11 – Option 2 Risk costs (per customer)

	Resulting Annual Risk costs ($ nominal)										
Year	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY20	FY30	FY31
Capital Cost	290										
O&M Cost		1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
Customer Benefits		276	276	276	276	276	276	276	276	276	276
Generator Benefits											
Retailer Benefits		55	55	55	55	55	55	55	55	55	55
DNSP Benefits		194	194	194	194	194	194	194	194	194	194

Table 12 – Option 3 Risk costs (per customer)

	Resulting Annual Risk costs ($ nominal)										
Year	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY20	FY30	FY31
Capital Cost	120										
O&M Cost		0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
Customer Benefits		276	276	276	276	276	276	276	276	276	276
Generator Benefits											
Retailer Benefits		117	117	117	117	117	117	117	117	117	117
DNSP Benefits		211	211	211	211	211	211	211	211	211	211

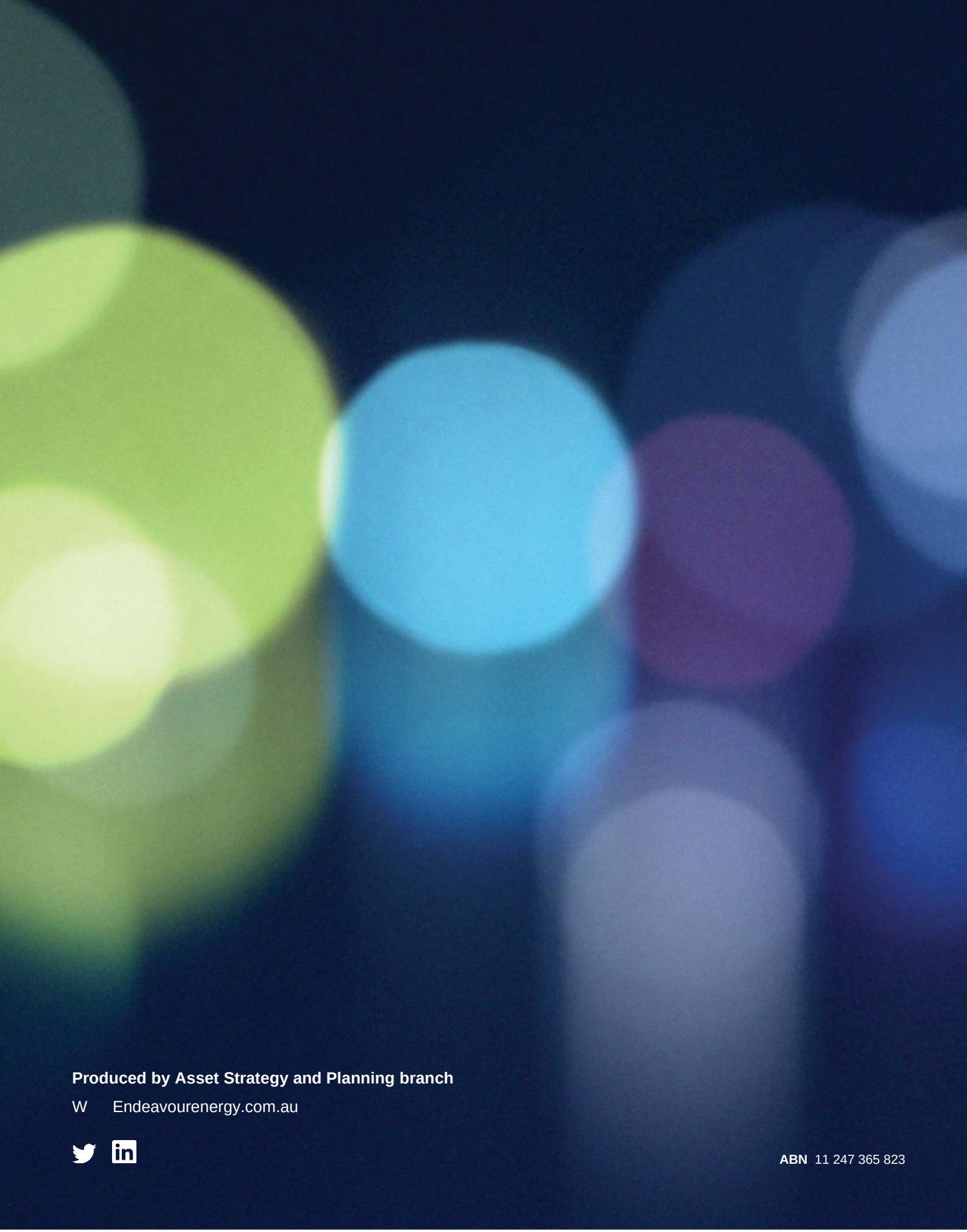
5. Preferred option

The preferred case, the option with the highest NPV in terms of benefits delivered relative to costs is Option 3 – replace the AFIC system on a targeted basis with smart meters.

Table 13 - Option Summary Table

Option	Description	Solution Type	Residual Risk Cost (or savings for Opportunities) Post Investment $	Total Proposed Investment Cost, capex/opex $	NPV (benefits less costs) $	Rank	Assessment Description
	No proactive intervention	Base Case	-2,161	0	-2,161	4	
1	Replace AFIC cells like for like	Network solution	0	379	4,571	2	
2	Convert controlled load relays to time switches	Network Solution	0	290	4,570	3	
3	Convert controlled load relay customer installations with smart meters	Network Solution	0	120	5,309	1	

Annexures



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