

Australian Energy Market Commission

DRAFT REPORT

REVIEW INTO CONSUMER ENERGY RESOURCES TECHNICAL STANDARDS

27 APRIL 2023

REVIEW

INQUIRIES

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ABOUT THE AEMC

The AEMC reports to the Energy Ministers' Meeting (formerly the Council of Australian Governments Energy Council). We have two functions. We make and amend the national electricity, gas and energy retail rules and conduct independent reviews for the Energy Ministers' Meeting.

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SUMMARY

- 1 The Australian Energy Market Commission (Commission or AEMC) has made draft recommendations that are aimed at improving compliance with the technical standards for consumer energy resources (CER) devices such as rooftop PV, battery energy storage systems, and electric vehicles.

Improved CER technical compliance is needed

- 2 Improving compliance with CER technical standards will benefit all electricity consumers in the national electricity market (NEM). This is because more CER devices will behave as expected, supporting distribution network service providers (DNSPs) and the NEM's market operator in operating the electricity system and planning for its future needs.
- 3 In addition, improved compliance will result in CER device owning consumers gaining greater benefits from their devices as well as enabling more consumers to connect new CER devices. This supports the security and reliability of power supply. It is also an important avenue for the energy sector to reduce emissions and contribute towards government commitments for Australia to achieve net zero.

Non-compliance affects the grid and consumer outcomes

- 4 The technical standards for CER devices such as rooftop PV, battery energy storage systems, and electric vehicles increasingly affect power grid outcomes for all consumers, device owners and non-device owners alike. With the continued utilisation of new CER devices at record rates, power grids such as the NEM will increasingly rely on standardised interactions between CER devices and other parts of the electricity system.
- 5 Through the National Electricity Rules (NER), the AEMC introduced new CER technical standards for DNSPs and consumers. The final rule commenced on 18 December 2021. This coincided with the date upon which Australian Standard (AS) 4777.2:2020 came into effect. AS4777.2:2020 requires inverters to promote the security and reliability of power supply by riding through voltage fluctuations on distribution networks.
- 6 However, to date, there has been significant non-compliance with this CER technical standard in the NER. For example, according to the Australian Energy Market Operator (AEMO), approximately 65 per cent of new installations in quarter 1 of 2022 were non-compliant across the NEM.¹ This unsuccessful implementation situation for both existing and future CER technical standards cannot continue — it raises significant concerns about the NEM's technical integration of CER. Ultimately, if left unaddressed, this continued non-compliance threatens to undermine the NEM's reliability, affordability, and transition to zero-emissions technologies.

1 AEMO, submission to the consultation paper, p. 4.

Improving compliance benefits consumers

7 To improve consumer outcomes and support continued decarbonisation, the Commission has made draft recommendations that aim to increase compliance with CER technical standards. The draft recommendations call for coordinated action by jurisdictions, industry, and the energy market bodies. They include 12 draft recommendations for immediate action and one draft recommendation to progress regulatory reform. This dual approach is advantageous because while acknowledging difficulties associated with existing regulatory frameworks, the draft recommendations nevertheless propose a way to start improving compliance with CER technical standards as much as possible within the existing regulatory framework.

8 The draft recommendations promote the energy objectives by:

- improving consumer outcomes
- supporting decarbonisation
- following principles of good regulatory practice
- maintaining safe, secure, and reliable power supply
- considering implementation.

Draft recommendations for immediate action

9 The 12 draft recommendations for immediate action are outlined below and include actions to improve compliance of CER devices.

10 The lifecycle for CER devices can be split into three stages: manufacture and supply, installation, and ongoing operations. Based on the available evidence, most non-compliance is occurring at the point of installation.²

- *Stage one: simplify devices at manufacture and supply*
 - Draft recommendation 1: Remove historical device settings
 - Draft recommendation 2: Make 'Region A' the default setting
 - Draft recommendation 3: Update devices remotely to support compliance
- *Stage two: promote compliant installation*
 - Draft recommendation 4: Make CER technical standards mandatory for New Energy Tech Consumer Code (NETCC) Approved Sellers
 - Draft recommendation 5: Mandate CER technical standards training for Small-scale Renewable Energy Scheme (SRES) accreditation
 - Draft recommendation 6: Funded training on CER technical standards for installers
 - Draft recommendation 7: Guidance on CER technical standards for installers
 - Draft recommendation 8: Introduce commissioning sheets for CER devices

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2 Non-compliant CER are being connected by DNSPs because there is a lack of implementation certainty at the point of connection — there has not been sufficient compliance oversight and enforcement action in the installation process or after due to a variety of reasons. On this basis the Commission makes its 12 immediate draft recommendations across the CER device lifecycle.

- *Stage three: support ongoing compliance*
 - Draft recommendation 9: Accelerated smart meter deployment with improved data access
 - Draft recommendation 10: Access to OEM compliance data
 - Draft recommendation 11: Defined process for contacting consumers
 - Draft recommendation 12: Subsidised re-configuration of non-compliant devices.

12 These recommended actions are encouraged to be taken voluntarily; there appears to be no impediments to do so and this will enable immediate implementation. At this time no rule changes are recommended because other measures, which may be explored through considering regulatory reform, are necessary to bring the different frameworks together to support the integration of CER.

13 The Commission estimates that if all immediate draft recommendations are implemented, the NEM can expect to see between half to almost all new devices compliant with CER technical standards. This compares with only one-third of new devices complying with CER technical standards upon the commencement of AS4777.2:2020 in the NEM.³ In addition, compliance of existing devices is expected to improve by more than 40 per cent.

14 In this way, the draft recommendations for immediate action would provide consumers with:

- *more secure and reliable power supply*

Because widespread inverter non-compliance with the fault ride-through requirements in AS 4777.2:2020 can create generation contingency risks in the event of disturbances in the power system (and particularly voltage disturbances) then taking action to improve compliance is expected to enable DNSPs and AEMO to provide a secure and reliable power supply.⁴
- *downward pressure on power prices*

Distributed voltage control by PV inverters is an efficient way to maintain distribution voltages within network power quality compliance limits. This is particularly important at the ends of distribution feeders that have high amounts of CER, where voltages at the upper edges of the allowable voltage range have been observed in many jurisdictions. Consequently, improved compliance with the standard will enable this more efficient voltage management to occur throughout a distribution network rather than the DNSP using more expensive management options.
- *an increased ability to connect new CER devices to the power grid*

Non-compliance with AS 4777.2:2020 can effectively reduce the CER hosting capacity of distribution feeders to connect new CER or maximise allocation of spare export capacity with existing CER customers. Improving CER technical standards compliance will have the effect of enabling more CER devices to be connected to a distribution network.

3 AEMO, submission to the consultation paper, p. 4.

4 AEMO, *Behaviour of distributed resources during power system disturbances*, May 2021.

Draft recommendation to progress regulatory reform

- 15 The Commission also recommends progressing reform of the national regulation of CER technical standards to achieve sustained compliance. This draft recommendation is that jurisdictions work with the energy market bodies to consider the options and viability of reforming the national regulation of current and any future CER technical standards.
- 16 Some stakeholders have suggested creating a national technical regulator to support improved compliance with CER technical standards. However, to date, there is little consensus on the model, functions, and implementation approach for such an entity.
- 17 Accordingly, the Commission considers more work is needed to determine if reform of national technical regulation is needed and, if so, the most appropriate reform model following implementation of the 12 immediate draft recommendations. Specifically, the issues to first resolve are:
- identifying the need for regulatory functions that would achieve sustainable compliance over the long-term
 - defining and consulting on necessary regulatory options
 - clarifying implementation requirements
 - assessing the costs and benefits of reform options.

Next steps

- 18 Stakeholder submissions in response to this draft report, including how the draft recommendations might improve compliance for existing and future CER technical standards, are requested by COB 25 May 2023. This will inform the final report to be published in mid-2023.

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1 PROBLEM OF NON-COMPLIANCE

On 29 September 2022, the AEMC self-initiated this review into consumer energy resources (CER) technical standards. The review is in response to concern among national electricity market (NEM) participants and others about the extent of non-compliance with CER technical standards in the National Electricity Rules (NER). Consequently, the review is focused on:

- compliance with, and enforcement of, CER technical standards in the NER
- the interpretation of standards by NEM participants and others
- interactions between the NER and other regulatory regimes.⁵

This chapter introduces the problem of non-compliance by explaining the:

- significant non-compliance with CER technical standards
- market impact of non-compliance
- fragmented regulation that is compounding the problem.

It then provides guidance to stakeholders on how to make a submission to this draft report.

1.1 Significant non-compliance with CER technical standards

As set out in the consultation paper for this review, there is significant non-compliance with CER technical standards in the NER.⁶ For more on CER technical standards in the NER, see Box 1.

BOX 1: WHAT ARE THE NER'S CER TECHNICAL STANDARDS?

On 25 February 2021, the Commission made a rule to introduce CER technical standards in the NER. The rule was made in response to a rule change request from AEMO.

This rule:

- created distributed energy resources (DER) Technical Standards for embedded generating units connecting to a distribution network through a micro embedded generators (EG) connection service
- defined 'DER Technical Standards' as the requirements for inverters as set out in Australian Standard AS4777.2:2020 as in force from time to time
- required embedded generating units the subject of model standing offers for basic micro EG connection services to comply with DER Technical Standards
- obliged Distribution Network Service Providers (DNSPs) to inform connection applicants about the need to comply with DER Technical Standards, if the connection applicant is proposing to connect a new or replacement embedded generating unit through a basic micro EG connection service

⁵ For more, see appendix F.

⁶ AEMC, *Review into consumer energy resources technical standards*, consultation paper, 29 September 2022, pp. 15-16.

- included a requirement in the minimum content requirements of connection offers for connection applicants connecting a new or replacement embedded generating unit to comply with the DER Technical Standards
- applied DER Technical Standards to new connections or replacement inverters and connection alterations.

The final rule commenced on 18 December 2021. This coincided with the date upon which AS 4777.2:2020 came into effect.

While this review's initial focus has been on the implementation of existing obligations in the NER (namely, AS 4777.2:2020), this experience is informing a broader analysis of approaches to implementing future CER technical standards.

Source: AEMC. See also clauses 5A.B.2, 5A.C.3, and Schedule 5A.1 of the NER.

In response to the consultation paper, stakeholders generally agreed that, notwithstanding incomplete data, non-compliance with CER technical standards is widespread. In particular:

- approximately 65 per cent of new installations in quarter 1 of 2022 (that is, immediately following the commencement of Australian Standard (AS) 4777.2:2020 requirements in the NER) were non-compliant across the NEM⁷
- while most new inverters comply with AS4777.2:2020 in laboratory testing, original equipment manufacturers (OEMs) are also retaining older versions of the standard in the settings interface⁸

AEMO worked with 10 major original equipment manufacturers (OEMs) to assess compliance for approximately 70 per cent of all inverters sold in quarter 1 of 2022. This showed that 45 per cent of devices were set to the 2020 version of AS4777.2, with 50 per cent set to the non-compliant 2015 version. A further 5 per cent were set to an international grid code and consequently had uncertain ride-through capabilities⁹ An estimated 25 per cent of the devices incorrectly set to 2015 version may still be able to withstand voltage disturbances due to revised firmware for the device. AEMO expected a further 25 per cent to exhibit poor ability to withstand voltage disturbance.¹⁰

If the lifecycle for CER devices is categorised in three stages (manufacture and supply, installation, and ongoing operations) then it appears that most non-compliance is occurring at installation. Batch testing by the University of New South Wales (UNSW) indicates most devices supplied in Australia comply with AS4777.2:2020.¹¹ Once devices are installed, there is little evidence to suggest widespread action by consumers to change settings for

7 As AEMO explained in support of this statistic, it 'assesses the rates of compliance through a combination of both technical settings on devices (including voluntary manufacturer remote querying of settings, and the CER's on-site audits of technical settings) and through field analysis (such as volt-var analysis by DNSPs using smart meter data, and post even analysis using third-party data sources': AEMO, submission to the consultation paper, pp. 4-7.

8 AEMO, submission to the consultation paper, p. 10.

9 AEMO, submission to the consultation paper, p. 10.

10 AEMO, submission to the consultation paper, p. 10.

11 ARENA and UNSW, *Addressing barriers to efficient renewable integration — milestone report 6*, June 2022: <https://arena.gov.au/assets/2022/04/addressing-barriers-to-efficient-renewable-integration-milestone-report-6.pdf>.

AS4777.2:2020. Nor would there be a clear financial incentive for consumers to adjust settings after installation — the cost and benefits from devices riding through voltage fluctuations accrue to the broader power grid rather than individual device owners.

It could be inferred from this analysis that non-compliance is primarily a problem about the process for installation, and actions in response should focus on this stage in the device lifecycle. However, the Commission considers the causes of non-compliance are likely to be more complex and relevant to all three stages in the device lifecycle. For example, at:¹²

- stage one, manufacture and supply, most manufacturers have retained old versions of technical standards in menu options. This is a recognised contributor to non-compliant installation.
- stage three, ongoing operations, even following efforts to remotely update settings (absent any other intervention), most identified devices remained non-compliant.

This suggests non-compliance with CER technical standards is a problem that needs to be considered across the lifecycle for CER devices, rather than focusing on one stage in the lifecycle to the exclusion of others.

For more on the extent of non-compliance with CER technical standards as experienced in the NEM to date, see the consultation paper for this review.¹³

1.2 Market impact of non-compliance

The primary market impact from non-compliance with CER technical standards is less secure and reliable power supply. The Commission considers this is an urgent problem requiring immediate action.

The impact on power supply from non-compliance with CER technical standards is due to:

- an increase in the size of credible contingencies due to non-compliance with CER technical standards
- an increase in the potential severity of non-credible contingencies related to CER devices¹⁴
- more limited opportunities for scheduled maintenance of the transmission network.

The Commission considers there are two further market impacts from non-compliance. These are:

- Reduced ability to connect and export new CER devices — this is due to:
 - existing CER device owners being more constrained than would be required to maintain safe operating conditions for the distribution network
 - new CER device owners being at greater risk of being 'crowded out' due to the higher constraints resulting from existing non-compliant connections

¹² ARENA, submission to the consultation paper, p. 2.

¹³ AEMC, *Review into consumer energy resources technical standards*, consultation paper, 29 September 2022.

¹⁴ In this draft report, 'CER devices' refers to a range of consumer energy devices (notably PV panels on homes) that are connected to a distribution network. Solar PV on homes are connected by an inverter that is required to comply with AS4777.2:2020.

- reduced opportunities for exports from both existing and new CER devices, which risks slowing the investment payback period for individual device owners and less overall supply.
- Upward pressure on power prices — if CER non-compliance were to continue at current trends, customer bills may be impacted via more wholesale electricity dependence and increased but avoidable network spending. This is because non-compliance is likely leading to an increased:
 - dependence on wholesale electricity compared with a power grid in which more consumers complied with CER technical standards
 - operational expenditure and augmentation expenditure by DNSPs.

The Commission has, at this stage, undertaken a predominantly qualitative assessment of these market impacts (for more, see appendix A). The final report will progress this analysis by including, to the extent possible, quantification of these impacts and further information provided by stakeholders. This will support an assessment of the net benefits from the recommendations.

1.3 Fragmented regulation compounds the problem

Problems of non-compliance are being compounded by the fragmented regulatory landscape for CER technical standards across the National Electricity Law (NEL), National Energy Retail Law (NERL) and other frameworks. Achieving compliance with CER technical standards can be complicated because the implementation and enforcement of technical standards relating to CER span across state, territory and Commonwealth regulatory frameworks.

Understanding the existing regulatory framework for CER technical standards is challenging for customers and market participants due to the differing jurisdictional frameworks and technical regulators and a lack of clarity as to how these different frameworks interact. This can create gaps that cannot be filled by more regulatory incentives or penalties — other measures are necessary to bring the different frameworks together to support the emergence of new and innovative technologies that create opportunities for all consumers.

The sizeable number of stakeholders involved at different stages of the CER lifecycle influences compliance and the complexity of the existing arrangements. Throughout the CER lifecycle, there are stakeholders with various roles and responsibilities that are regulated both under the NER and external to the NER. These include manufacturers, retailers, installers, customers, operators or agents, DNSPs, electrical product suppliers, technology and software providers, industry and end-user bodies, administering government agencies and regulatory authorities.

For example, at a high level, under existing regulatory arrangements:¹⁵

- the NER and NER (Northern Territory) require DNSPs to impose minimum content requirements to model standing and any other connection offers and negotiated

¹⁵ Baker McKenzie, *Review into consumer energy resources technical standards*, April 2023, pp. 1-2.

connection contracts, requiring owners, controllers and operators of CER to comply with AS 4777.2:2020 (as it changes from time to time)

- at the Commonwealth level, the Clean Energy Regulator oversees the Small-scale Renewable Energy Scheme (SRES) and small-scale technology certificates (STCs), which cannot be created with respect to small generation units unless the installer provides a written statement that the model of inverter used in installation complied with the same standard, AS 4777.2:2020
- the electrical safety legislation applying in each state or territory primarily regulates the installation and maintenance of CER (as part of the regulation of electrical installations more generally), requiring contractors carrying out such work to ensure it complies with standards prescribed by the regulations
- in general, state and territory based technical regulators have broad enforcement powers to investigate, request information, inspect and enter premises for the purposes of monitoring compliance and enforcement. Penalties for non-compliance include infringements and penalties attracting penalty units or prison (for individuals).

For more on the broader regulatory context for CER technical standards, see appendix B.

1.4 How to make a submission

Stakeholder submissions and information will inform the Commission's development of the final recommendations for this review. This is particularly relevant to better understand the potential impacts of the recommendations and relevance to future CER technical standards.

How to make a written submission

Written submissions responding to this draft report are requested by COB 25 May 2023 through the AEMC website, www.aemc.gov.au, using the 'lodge a submission' function under the 'Contact Us' tab, and the project reference code **EMO0045**.

The AEMC publishes submissions on its website. It will not publish parts of a submission that are agreed as confidential, or that are inappropriate (for example offensive or defamatory content, or content that is likely to infringe intellectual property rights).¹⁶

Further opportunities for engagement

There are other opportunities to engage on this project, such as one-on-one discussions with the project team. If you are interested or seek for further information on this project, please use the details below.

Contact details

Project leader: Andrew Swanson

Email: andrew.swanson@aemc.gov.au

Telephone: 02 8296 7835

¹⁶ For more see: <https://www.aemc.gov.au/contact-us/lodge-submission>

2 OVERVIEW OF DRAFT RECOMMENDATIONS

This chapter provides an overview of the Commission's draft recommendations to improve consumer outcomes from compliance with CER technical standards by explaining the:

- dual approach to improving compliance
- high-level estimate of market impacts
- promotion of the energy objectives.

2.1 Dual approach to improving compliance

The Commission has made 12 draft recommendations for immediate action, and one draft recommendation to progress regulatory reform, with the aim to improve compliance of CER devices with CER technical standards.

Each draft recommendation, and how the proposed measures would work together, is outlined below.

2.1.1 Outline of the draft recommendations for immediate action

The draft recommendations for immediate implementation seek to address the reasons that have been identified for non-compliance across all three stages in the lifecycle for CER devices. These three stages are: manufacture and supply, installation, and ongoing operations.

Stage one: simplify devices at manufacture and supply

- *Remove historical device settings*
Implementation of this draft recommendation would involve OEMs voluntarily removing historical versions of NER CER technical standards from the settings menu for new CER devices. The purpose of this recommendation is to make current versions of NER CERTS clearly identifiable for the installer when connecting a CER device to the distribution network.
- *Make 'Region A' the default setting*
Under this draft recommendation OEMs would voluntarily make AS 4777.2:2020 'Region A' (which is used for mainland NEM jurisdictions) the default setting on new CER devices. This default setting would allow the installation process to be streamlined and materially reduce confusion among installers.
- *Update devices remotely to support compliance*
OEMs remotely updating devices to remedy non-compliance with NER CER technical standards where possible is also recommended. The purpose of this recommendation is to improve compliance with the CER technical standards for existing CER devices. Making remote updates is expected to be a relatively low cost method of improving the overall compliance rate of devices across distribution networks.

For more on draft recommendations for the manufacture and supply of CER devices, see chapter 3.

Stage two: promote compliant installation

- *Make CER technical standards mandatory for New Energy Tech Consumer Code (NETCC) Approved Sellers*

Implementing this draft recommendation would involve the Clean Energy Council (CEC) (who administers the NETCC) introducing NER CER technical standards as a requirement for being listed as an approved seller following NETCC amendments. This recommended change to the accreditation criteria would assist customers find sellers that comply with NER CER technical standards.

- *Require CER technical standards training for Small-scale Renewable Energy Scheme (SRES) accreditation*

Under this draft recommendation, installer training on NER CER technical standards would become mandatory for accreditation under the Commonwealth's SRES. The entities administering SRES accreditation would be the parties to provide the new training requirement for installers that are already accredited as well as update the SRES accreditation requirements.

- *Funded training on CER technical standards for installers*

Implementation of this draft recommendation would involve jurisdictions and/or DNSPs funding training on NER CER technical standards for installers. The training would assist installers in understanding obligations in installing and commissioning new systems and consequently, reduce errors that may result in CER devices becoming non-compliant with CER technical standards.

- *Guidance on CER technical standards for installers*

Implementation of this draft recommendation would see the CEC, in its role as an industry body, providing guidance material for installers to support correctly configuring devices in compliance with NER CERTS.

- *Introduce commissioning sheets for CER devices*

DNSPs would implement this draft recommendation by introducing commissioning sheets that include step by step good practice guidance and also require responses from installers to show the DNSP, and the consumer, that the device has been properly configured.

For more on draft recommendations for the installation of CER devices, see chapter 4.

Stage three: support ongoing compliance

- *Accelerated smart meter deployment with improved data access*
As discussed in the AEMC's metering review, the accelerated deployment of smart meters with improved data access for DNSPs would support compliance monitoring for CER technical standards.¹⁷ The ability for DNSPs to have greater access to data from smart meters would assist DNSPs to detect and then address non-compliance devices.
- *Access to OEM compliance data*
Implementing this draft recommendation would see OEMs providing data to DNSPs and AEMO to better support the monitoring of non-compliance. This would be done by OEMs voluntarily and would supplement data from smart meters. Improved information on compliance issues will enable DNSPs to then take action to rectify the identified non-compliance.
- *Defined process for contacting consumers*
Implementation of this draft recommendation would involve DNSPs developing and following a defined process for contacting customers suspected of CER technical standards non-compliance and explaining options for returning to compliance.
- *Subsidised re-configuration of non-compliant devices*
Under this draft recommendation jurisdictions would consider establishing programs to provide subsidies to support consumers re-configuring non-compliant devices where it is efficient to do so, such as where remote reconfiguration is not feasible. This would relieve the burden on consumers to make sure CER devices are compliant with CER technical standards in accordance with the connection agreement.

For more on draft recommendations for ongoing operations, see chapter 5.

The proposed implementation of these draft recommendations accounts for the AEMC's limited rule-making ability in relation to CER technical standards. This is closely related to the way in which fragmented regulatory frameworks limit options to improve compliance (for more, see section 1.3 and appendix B).

For an illustration of the 'cascading' nature of the draft recommendations for immediate action, see Figure 2.1.

As part of developing the immediate draft recommendations above, the Commission considered whether jurisdictions could consider if receipt of feed-in tariffs for newly installed devices should be made contingent on demonstrating compliance with CER technical standards. The context for this consideration was noting that this approach has been implemented, for example, by CitiPower, Powercor and United Energy in Victoria.¹⁸

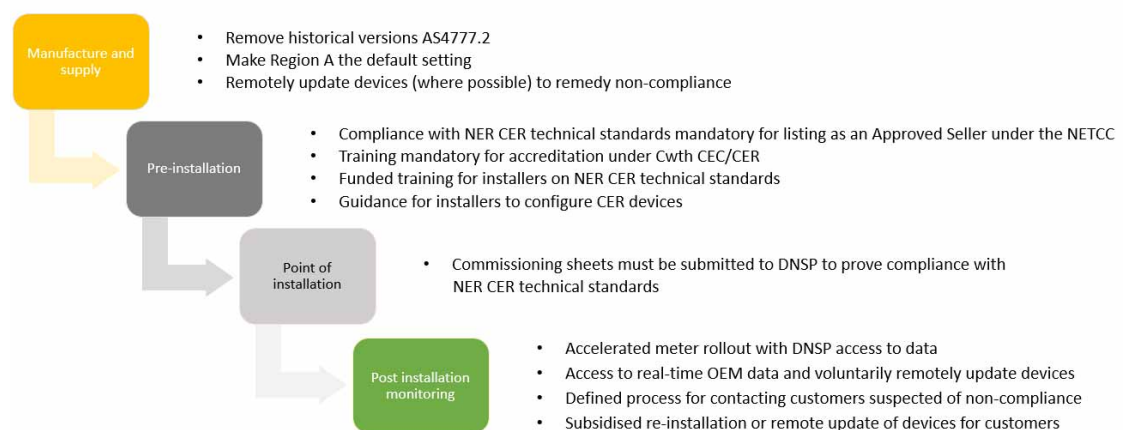
The Commission also notes that the expected continuation of declining rates for feed-in tariffs could render the approach of reducing feed-in tariffs for non-compliant CER devices less effective over time. Nevertheless, stakeholders views on this course of action, and its

¹⁷ AEMC, *Review of the regulatory framework for metering services*, draft report, 3 November 2022.

¹⁸ CitiPower, Powercor and United Energy, submission to the consultation paper, p. 2.

potential impact on consumers as well as CER technical standard compliance rates are sought to assist with the final report for this review.

Figure 2.1: Cascading nature of immediate draft recommendations



Source: AEMC.

Proposed roles minimise burden for consumers




If implemented, the proposed actions under the 12 draft recommendations would minimise the burden on consumers. Instead, the following parties would be undertaking the recommended actions with the aim of improving CER technical standards compliance.

- OEMs would:
 - voluntarily remove historical versions of NER CER technical standards from the settings menu for new CER devices
 - be requested to make AS 4777.2:2020 Region A (used for mainland NEM jurisdictions) the default setting on new CER devices
 - determine how to remotely update devices (where possible) to remedy non-compliance with NER CER technical standards.
- DNSPs would:
 - introduce commissioning sheets for installers to prove compliance with NER CER technical standards before devices are connected to the network
 - (potentially) fund training for installers on NER CER technical standards
 - contact customers suspected of non-compliance and provide information explaining options for returning to compliance.
- Installers would:

- comply with NER CER technical standards to be able to be listed as an Approved Seller under the NETCC
- undertake NER CER technical standards training for accreditation under the Commonwealth’s Small-scale Renewable Energy Scheme
- be responsible for demonstrating compliance to the DNSP and consumers.
- The Clean Energy Council would:
 - require compliance with NER CER technical standards as a condition for listing Approved Seller under the NETCC
 - provide guidance material for installers to support configuring devices in compliance with NER CER technical standards.
- Jurisdictions would:
 - consider subsidising re-installation or reconfiguration of existing non-compliant devices
 - (potentially) fund training for installers on NER CER technical standards.

For a summary of these roles across the three stages in the CER device lifecycle based on this report’s recommendations, see Figure 2.2.

Figure 2.2: Recommended immediate actions across three stages in device lifecycle

 A: Manufacture and supply	 B: Installation	 C: Ongoing operations
<ul style="list-style-type: none"> • Original equipment manufactures (OEMs) to: <ul style="list-style-type: none"> • remove historical versions of NER CER technical standards from the settings menu for new CER devices • make AS 4777.2:2020 Region A (mainland NEM jurisdictions) the default setting on new CER devices • remotely update devices (where possible) to remedy non-compliance with NER CER technical standards 	<ul style="list-style-type: none"> • DNSPs to introduce commissioning sheets for installers to prove compliance with NER CER technical standards before devices are connected to the network • Installers to: <ul style="list-style-type: none"> • comply with NER CER technical standards for listing as Approved Sellers under the NETCC • undertake NER CER technical standards training for accreditation under the Commonwealth’s Small-scale Renewable Energy Scheme • DNSPs and/or Jurisdictions to fund training for installers on NER CER technical standards • The Clean Energy Council (CEC) to: <ul style="list-style-type: none"> • require compliance with NER CER technical standards as a condition for listing Approved Seller under the NETCC • provide guidance material for installers to support configuring devices in compliance with NER CER technical standards 	<ul style="list-style-type: none"> • DNSPs to contact customers suspected of non-compliance and with information explaining options for returning to compliance • Retailers to accelerate rollout of smart meters to better detect non-compliance (this is from the metering review) • Metering coordinators to provide DNSP access to metering data to support monitoring (this is from the metering review) • OEMs to provide real-time compliance data to DNSPs • Jurisdictions to: <ul style="list-style-type: none"> • subsidise re-installation or reconfiguration of existing non-compliant devices

Source: AEMC.

2.1.2

Outline of the draft recommendation to progress regulatory reform

In addition, the Commission recommends progressing reform of the national regulation of CER technical standards. This would involve jurisdictions working with the energy market bodies to investigate the options and viability of reforming the national regulation of CER technical standards that will be able to achieve sustained compliance (for the current and future technical standards) over the longer-term.

Jurisdictions and market bodies could assess reform options by:

- identifying the need for new regulatory functions
- defining and consulting on regulatory options
- clarifying implementation requirements
- assessing the costs and benefits of reform options.

For more on this draft recommendation, see chapter 6.

2.1.3

Dual approach supports immediate action

The Commission considers the dual approach — focusing on draft recommendations for immediate action and regulatory reforms for the longer-term — is advantageous because it:

- allows for immediate action, where possible, to start improving compliance with CER technical standards within existing regulatory frameworks
- acknowledges difficulties associated with existing regulatory frameworks
- recognises that any efforts to reform regulatory frameworks will require work by jurisdictions, in close cooperation with the AEMC and other energy market bodies.

This approach should support the realisation of consumer benefits from incremental improvements in compliance rates while also progressing reform developments.

As SA Power Networks estimates, improving compliance with CER technical standards can double PV hosting capacity.¹⁹

¹⁹ SA Power Networks information to AEMC.

Figure 2.3: Incremental improvement in PV hosting capacity as compliance increases



Source: SA Power Networks.

As noted, this review has considered the issue of CER technical standards compliance in connection with AS4777.2. However, the recommended actions set out above are also relevant considerations for establishing an environment that supports compliance with technical standards generally. For example, for any new technical standards, the relevant agency should consider if suitable guidance and training is provided to installers, and if data to monitor compliance is available to the relevant parties.

BOX 2: WHAT DOES 'VOLT-VAR' MEAN?

When discussing the consequences of non-compliance with CER technical standards, a common term used by engineers and other technically minded analysts of the power system is 'volt var'. This is because in technical terms, AS 4777.2:2020 requires the inverter's 'volt-var' response mode to be enabled by default.

'Volt-var' is a control mode within a PV inverter where the inverter adjusts its reactive power (var) absorbed or supplied in response to local voltages (volt). The inverter absorbs reactive power when voltages are high (e.g., above 240 V), and supplies reactive power when voltage

is low (e.g., below 220 V), with the overall aim of supporting voltages to be as close to the nominal voltage (e.g., 230 V) as possible.

Operating PV inverters in volt-var response mode is an efficient way to maintain distribution voltages within network power quality compliance limits. This is particularly important at the ends of distribution feeders that have high penetrations of CER, where high voltages at the upper edges of the allowable voltage range have been observed in many jurisdictions. In practice, enabling the volt-var response mode in compliant inverters means the device is configured to monitor and support local voltages whereas non-compliant inverters without the volt-var response mode enabled are typically indifferent to local voltages.

Source: AEMC.

2.2 Overall market impact of recommendations

The Commission estimates that if all immediate draft recommendations are implemented the NEM can expect to see between half to almost all new devices compliant with CER technical standards. This compares with only one-third of new devices complying with CER technical standards upon the commencement of AS4777.2:2020 in the NEM.²⁰ Further, the AEMC estimates the draft recommendations would lead to between 6 and 40 per cent of existing non-compliant devices becoming compliant. These estimates are based on a 'ground up' consideration of the likely impact of each draft recommendation.

This improvement in CER technical standards compliance rates would, broadly, support outcomes in the NEM by providing for:

- *more secure and reliable power supply.* Because widespread inverter non-compliance with the fault ride-through requirements in AS 4777.2:2020 can create generation contingency risks in the event of disturbances in the power system (and particularly voltage disturbances), taking action to improve compliance is expected to enable DNSPs and AEMO to provide a more secure and reliable power supply.²¹
- *downward pressure on power prices.* Distributed voltage control by PV inverters is an efficient way to maintain distribution voltages within network power quality compliance limits. This is particularly important at the ends of distribution feeders that have high penetrations of CER, where high voltages at the upper edges of the allowable voltage range have been observed in many jurisdictions. Consequently, improved compliance with the standard will enable this more efficient voltage management to occur throughout a distribution network rather than the DNSP using more expensive management options.
- *an increased ability to connect new CER devices to the power grid.* Non-compliance with AS 4777.2:2020 can effectively reduce the CER hosting capacity of distribution feeders to connect new CER or maximise allocation of spare export capacity with existing CER customers. Improving CER technical standards compliance will have the effect of enabling

²⁰ AEMO submission to the consultation paper, p.4.

²¹ AEMO, *Behaviour of distributed resources during power system disturbances*, May 2021.

more CER devices to be connected to a distribution network. As SA Power Networks estimates, improving compliance with CER technical standards can double PV hosting capacity.²²

For more on the market impact of non-compliance, see appendix A.

2.3 Promotion of the energy objectives

The Commission considers there are five key ways in which the draft recommendations would promote the national electricity objective (NEO) and the national energy retail objective (NERO).

- *Improving consumer outcomes.* Consumer outcomes for device owners and consumers more broadly should improve because:
 - device owners would be provided with increased support for the sale and installation of compliant CER devices through interventions across the device lifecycle.
 - electricity consumers in general would benefit from measures to reduce the likelihood of non-compliance and the costs of higher network expenditure and in wholesale energy and ancillary service markets from high levels of CER technical standards non-compliance.
 - consumer outcomes would be improved through draft recommendations that are compatible with the way most consumers engage with CER devices across the device lifecycle.
- *Maintaining safe, secure, and reliable power supply.* The draft recommendations are expected to support the safe, secure, and reliable power supply by enabling a greater role of CER in contributing to the efficient operation of distribution and transmission networks.
- *Considering implementation.* In developing the draft recommendations, the Commission has considered implementation issues, such as the need to:
 - only intervene where the costs and complexities of actions are expected to be less than the benefits for consumers
 - account for interactions between jurisdictional frameworks when seeking to achieve NEM-wide outcomes.
- *Following principles of good regulatory practice.* The principles of good regulatory practice have been a factor in developing the draft recommendations, specifically:
 - making compliance with CER technical standards simpler and more transparent than is presently the case, notwithstanding the need to account for constraints imposed by jurisdictional limitations and interactions between the NER and other regulatory frameworks
 - following, where possible and appropriate, a principles-based approaches to regulation that emphasises outcomes over prescriptive, detailed approaches and

22 SA Power Networks information to AEMC.

retains sufficient flexibility for NEM participants and others to support these outcomes flexibly and efficiently.

- *Supporting decarbonisation.* By promoting compliance with CER technical standards, the draft recommendations should support decarbonisation objectives of jurisdictions and the energy sector by allowing for increased reliance on zero-emissions technologies in the electricity sector. Promoting greater alignment across regulatory frameworks would, in addition, support the efficacy of other regulatory frameworks (such as the SRES) in pursuing emissions reductions.

For more on the Commission's promotion of the energy objectives through this review, see appendix D. Further detail on the way in which each draft recommendation would promote the NEO and the NERO is provided throughout the remainder of this draft report.

3 STAGE ONE: SIMPLIFY DEVICES AT MANUFACTURE AND SUPPLY

The first stage in the life cycle of a CER device is manufacture and supply. This chapter outlines draft recommendations to simplify devices at manufacture and supply to support improved compliance with CER technical standards. In this way, the draft recommendations for stage one intend to reduce the likelihood that non-compliance will occur once the device is installed and operational.

Implementation of these draft recommendations for stage one seeks immediate voluntary action by OEMs. This approach is in recognition of the AEMC's limitations on making rules that would introduce mandatory requirements for the envisaged actions. The Commission will nevertheless engage with OEMs to incorporate any suggestions for a more practical implementation of the envisaged actions in the final report. This will build on significant cooperation to date between AEMO and several OEMs, as well as research funded by ARENA in support of simplified devices at manufacture.²³

The Commission's high-level estimate is that implementation of all the draft recommendations for immediate action during the manufacture and supply of CER devices would contribute to between 22 per cent and 65 per cent of the estimated improvement in compliance for new connections.²⁴

BOX 3: DRAFT RECOMMENDATIONS AT THE MANUFACTURE AND SUPPLY STAGE

Draft recommendation 1: OEMs voluntarily remove historical versions of NER CER technical standards from the settings menu for the inverter on new CER devices.

Draft recommendation 2: OEMs voluntarily make AS 4777.2:2020 'Region A' (mainland NEM jurisdictions) the default setting on new CER devices.

Draft recommendation 3: OEMs to voluntarily update devices remotely where possible to remedy non-compliance with NER CER technical standards.

3.1 Draft recommendation 1: Remove historical device settings

The Commission's draft recommendation is that OEMs voluntarily remove historical versions of NER CER technical standards from the settings menu for new CER devices.

²³ ARENA, submission to the consultation paper, pp. 1-2.

²⁴ Added across all three stages in the device lifecycle, the total estimated market impact of draft recommendations exceeds 100 per cent. This reflects significant uncertainty about the actual level of compliance that would follow from the implementation of each specific draft recommendation.

The purpose of this draft recommendation is to make the current version of NER CER technical standards the only version available for selection by the installer when they are connecting a CER device to a distribution network.

Voluntary adoption of this draft recommendation is sought from OEMs; the Commission cannot place direct obligations on OEMs through the NER or NERR as they are not NEM participants.

3.1.1 **Reasons for draft recommendation**

Manufacturers tend to build devices with multiple configuration profiles to comply with different international jurisdictions. Examples include AS 4777.2 in Australia and Institute of Electrical and Electronics Engineers (IEEE) 1547 in the US. The latest AS4777.2 profiles are therefore not always the default setting on CER devices sold in Australia.

Further, some devices retain older versions of CER technical standards. Retention of older requirements in the device's settings can cause confusion and make installation of devices with the functionality intended from the latest version of CER technical standards for the Australian market more difficult.

For example, AEMO has found evidence of CER devices that have been set with old AS 4777.2 profiles or international profiles. As a result, these devices do not conform with expectations such as voltage ride-through as required by AS 4777.2:2020.²⁵

Removing historical device settings would therefore simplify the process of connecting CER devices to the grid in accordance with NER CER technical standards relatively inexpensively. Installers would have fewer settings options to choose from, making the process of selecting the most up to date version of NER CER technical standards simpler and less confusing. This would increase the efficiency of installation and reduce the risk of non-compliance at the installation stage of a device.

AEMO has been working with OEMs on a voluntary basis to remove out of date requirements from setting options. It estimates that its efforts to encourage OEMs to update settings menus could lead to NER CER technical standards compliance rates of about 80 per cent by mid-2023.²⁶

3.1.2 **Stakeholder views**

Stakeholders expressed support for this recommendation in addressing the problem. NSW DNSPs noted in their submission that the removal of historical device settings would improve and streamline the installation process.²⁷

Jemena also noted that OEMs should be required to release devices with settings pre-configured to the latest version of Australian Standards, to avoid confusion at installation.²⁸ Jemena considered it is more efficient to address compliance requirements with inverter

²⁵ AEMO, submission to the consultation paper, p. 10.

²⁶ AEMO, advice to AEMC.

²⁷ NSW DNSPs, submission to the consultation paper, p. 9.

²⁸ Jemena, submission to the consultation paper, p. 1.

standards early in the supply process, rather than leaving the end of the supply chain to address inverter setting issues.²⁹

3.1.3 Implementation

The draft recommendation is for OEMs to voluntarily update the settings menu on their CER devices. If implemented, this measure, along with draft recommendation 2, is expected to reduce the incidence of compliance issues for all new installations.

Since the Commission is limited in its rule-making powers to place obligations on non-NEM participants, implementation of this draft recommendation requires OEMs to undertake this measure voluntarily. Despite this, the draft recommendation has been made in recognition of the success AEMO has had in encouraging OEMs to take this action. AEMO has indicated that not all OEMs are willing to implement these measures without a more persuasive push. This represents a limitation to what can be achieved voluntarily. Nevertheless, the AEMC supports AEMO's work with OEMs and the expansion of this practice as widely as possible.

3.2 Draft recommendation 2: Make 'Region A' the default device setting

The Commission's draft recommendation is that OEMs make AS 4777.2:2020 'Region A' (which is relevant for mainland NEM jurisdictions) the default setting on new CER devices.

This would allow the installation process to be streamlined and reduce confusion among many installers. As a consequence, non-compliance with the standard should be reduced for newly installed devices in the relevant jurisdictions.

Voluntary adoption of this draft recommendation is sought from OEMs as the Commission cannot place direct obligations on OEMs through changes to the NER or NERR.

3.2.1 Reasons for draft recommendation

AS 4777.2:2020 has separate profiles for different grid conditions. This includes large interconnected grid settings for the mainland NEM, a small interconnected grid which includes Western Australia, and small islanded systems, which include Northern Territory. The vast majority of devices sold in the Australian market connect to mainland NEM jurisdictions, which is 'Region A'. This action would therefore support the simplicity of connecting new CER devices in mainland jurisdictions in accordance with NER CER technical standards. The draft recommendation would increase the simplicity and efficiency of installation at a relatively low cost, with manufacturers only required to update the software setting on the device after it has been built.

3.2.2 Stakeholder views

Stakeholders noted that the action set out in this draft recommendation would help improve non-compliance. CitiPower, Powercor and United Energy noted in their submission that OEMs need to make it clear for installers on how to select 'Region A' when installing the device.³⁰

²⁹ Jemena, submission to the consultation paper, p. 1.

³⁰ CitiPower, Powercor, United Energy, submission to the consultation paper, p. 2.

Since much of the confusion and selection of the wrong settings is a key driver of non-compliance, it is imperative that inverters being sold in Australia are deployed with the appropriate firmware to meet current Australian standards.

3.2.3

Implementation

The draft recommendation is to be carried out voluntarily by OEMs on newly manufactured CER devices as the Commission's rule-making powers do not currently extend to OEMs.

Making 'Region A' the default setting sits with the draft recommendation 1 of removing or hiding older 2015 and 2005 standards from the options presented to installers. As a result of implementing both these draft recommendations, many installations (particularly those located in the NEM mainland jurisdictions) would not require the installer to search for the correct setting as one step in the installation process, making it easier and quicker to install. This would support greater compliance with AS 4777.2:2020 in these locations.

For other locations in Australia, an installer will be required to select the correct region setting as is the current practice. However, implementation of draft recommendation 1 is expected to make this task easier to carry out and consequently, support a greater number of CER devices being installed in a manner that is compliant with CER technical standards.

3.3

Draft recommendation 3: Update devices remotely to support compliance

The Commission's draft recommendation is that OEMs remotely update devices to remedy non-compliance with NER CER technical standards where it is possible to do so.

The purpose of this draft recommendation is to assist DNSPs in their role of monitoring ongoing CER compliance through updates that automatically comply with NER CER technical standards.

Voluntary adoption of this draft recommendation is sought from OEMs as the Commission cannot place direct obligations on OEMs through the NER or NERR as they are not NEM participants.

3.3.1

Reasons for draft recommendation

Manufacturers of CER devices often have remote monitoring capabilities of their devices via the internet. This is often used to enable consumers to access inverter performance data on their smartphones. Some OEM monitoring platforms are also able to make configuration changes to the inverter remotely which is relevant to address existing non-compliance and assists with implementation of future standards. However, there is currently no requirement, incentive, or explicit policy recommendation that manufacturers install this capability or, where it does exist, update device configurations to comply with NER CER technical standards. In other words, there is a missed opportunity to rely on technology to promote greater compliance with NER CER technical standards.

The implementation of this draft recommendation would contribute to the overall package of draft recommendations for immediate action in supporting DNSPs in operating the grid safely,

securely, and reliably. It would provide data on the scope of potential non-compliance with CER technical standards and support efforts by DNSPs and others to mitigate these consequences for the benefit of consumers and the broader electricity market. While there would be some costs associated with this voluntary measure, these are likely to be outweighed by expected benefits and the relative ease of implementation.

Several OEMs are already remotely updating devices voluntarily in cooperation with AEMO at a low to moderate cost (depending on the existing capability of OEMs). This program has had some success already as identified by AEMO and the Commission supports the continuation and expansion of the program where it can support improved compliance with CER technical standards.

3.3.2 Stakeholder views

Some stakeholders supported using remote updates from OEMs to improve compliance with the CER technical standard where non-compliance has been detected. NSW DNSPs, for example, noted that remote updates from OEMs will improve and streamline the installation process.³¹ They noted however that this could be challenging, given that the customer is not the OEM and the connection agreement is between the customer and the DNSP.

3.3.3 Implementation

The draft recommendation is for OEMs to implement voluntarily as soon as possible. Remotely updating devices could be done in response to a request from DNSPs for sites and connections where the DNSP has identified a CER device that is not likely to be compliant with relevant NER CER technical standards. It could also be done where the OEM detects likely non-compliance.

There are some limitations where there is an insufficiently reliable internet connection to support remote firmware updates by the OEM. In these instances, non-compliant devices would not be able to be updated remotely and would potentially require a site visit to remedy. Nevertheless, where less expensive remote updates can be made, this should be carried out as the improved compliance is expected to benefit DNSPs and AEMO operations.

³¹ NSW DNSPs, submission to the consultation paper, p. 9.

4 STAGE TWO: PROMOTE COMPLIANT INSTALLATION

The second stage in the life cycle for CER devices is installation. This chapter sets out the Commission's draft recommendations that can be implemented immediately to improve compliance at this stage.

In this way, the draft recommendations described in this chapter provide measures to promote the likelihood of correctly configured devices even allowing for potential complications with settings options following implementation of the draft recommendations described in chapter 3.

The Commission's high-level estimate is that implementation of all the draft recommendations for immediate action during the installation of CER devices would contribute to between 29 per cent and 72 per cent of the estimated improvement in compliance for new connections.³²

BOX 4: DRAFT RECOMMENDATIONS AT THE INSTALLATION STAGE

Draft recommendation 4: The CEC introduces NER CER technical standards as a requirement to be listed as an approved seller following New Energy Tech Consumer Code amendments.

Draft recommendation 5: NER CER technical standards training be mandatory for accreditation under the Commonwealth's Small-scale Renewable Energy Scheme. This would be undertaken by entities administering SRES accreditation.

Draft recommendation 6: DNSPs and/or jurisdictions provide funded training on NER CER technical standards for installers.

Draft recommendation 7: CEC publish and make freely available guidance material for installers to support configuring devices in compliance with NER CER technical standards. This would be done by the CEC voluntarily as a form of industry self-regulation.

Draft recommendation 8: DNSPs to introduce commissioning sheets that include step by step guidance and require responses to show to the DNSP that the device is been properly configured.

³² Added across all three stages in the device lifecycle, the total estimated market impact of draft recommendations exceeds 100 per cent. This reflects significant uncertainty about the actual level of compliance that would follow from the implementation of each specific draft recommendation.

4.1 Draft recommendation 4: Make CER technical standards mandatory for NETCC approved sellers

The Commission's draft recommendation is that the CEC introduce compliance with NER CER technical standards as a requirement to be listed as an 'approved seller' following NETCC amendments.³³

According to the CEC, an 'approved seller' is:³⁴

a business that provides new energy tech products, systems and services to residential and small-business customers and that has successfully demonstrated to the Code Administrator [CEC] that they have the processes and procedures in place to ensure ongoing compliance with the standards outlined by the NETCC. To remain on the [NETCC] program, approved sellers are required to uphold the standards of the NETCC in all their interactions with consumers.

This draft recommendation is aimed at assisting customers find sellers that comply with NER CER technical standards through the use of the NETCC. In this way, consumers will be less likely to use sellers that do not comply with NER CER technical standards and are not listed under the NETCC.

Implementation by the CEC, as the body responsible for administering the NETCC, would be voluntary as the Commission cannot impose obligations on the CEC under the NER or NERR.

4.1.1 Reasons for draft recommendation

Commencing in February 2023, the NETCC is a set of standards to protect consumers purchasing and installing new energy technology such as rooftop PV. For more on the NETCC, see Box 5.

BOX 5: WHAT IS THE NEW ENERGY TECH CONSUMER CODE (NETCC)?

The NETCC sets a minimum standard of service for customers looking to purchase new energy tech products, systems and services. New energy tech providers who have been approved by the 'Code Administrator' (the CEC) as a NETCC Signatory are bound to comply with this Code when providing New Energy Tech to their customers.

New energy tech is defined by the Code to include:

- small-scale (in-home or small business) products and systems that generate, store or trade energy away from Australia's main transmission and distribution networks or as CER connected to a principal energy transmission or distribution network
- services that support or are closely related to those products and systems

33 New Energy Tech Consumer Code, *The new energy tech consumer code*, February 2023: <https://www.newenergytech.org.au/netcc-standards> (accessed 13 April 2023).

34 Clean Energy Council, *NETCC frequently asked questions*, February 2023: <https://www.newenergytech.org.au/faqs> (accessed 13 April 2023).

- products, systems and services that monitor or manage a customer's usage of energy whether on or off an energy network
- any other product, system and service that the CEC is satisfied is appropriately within the NETCC.

Non-exhaustive examples of New Energy Tech include CER devices that are connected to the network such as solar PV, wind, hydro and bioenergy generators. An 'approved seller', is a business that provides new energy tech products, systems and services to residential and small-business customers and that has successfully demonstrated to the Code Administrator that they have the processes and procedures in place to ensure ongoing compliance with the standards outlined by the NETCC.

Participation in the NETCC is voluntary. An applicant may become an approved seller if it demonstrates that the requirements of the NETCC are met. These requirements include ensuring any products are delivered and installed in accordance with 'all applicable safety standards, manufacturer's specifications, relevant Australian Standards, Energy network standards and good industry practice.'

Energy ministers have tasked the CEC with administering the NETCC, with the code itself authorised by the Australian Competition & Consumer Commission. The program is governed by a Council of representatives from key industry and consumer protection bodies. This includes representatives from the Australian Energy Council, the CEC, the Public Interest Advocacy Centre, Energy Consumers Australia, Energy Networks Australia, Renew and Consumer Action Law Centre.

Source: Clean Energy Council, *About the NETCC: frequently asked questions*, February 2023: <https://www.newenergytech.org.au/faqs> (accessed 13 April 2023); Baker McKenzie, *Review into CER technical standards: appendix*, 27 April 2023, p. 22.

Consumers are the contractual party responsible for compliance with NER CER technical standards with DNSPs. However, in practice successful compliance relies on the consumer's choice of installer and CER device. There is currently significant interest in accessible information for consumers on which installers and devices in the market have a better record for supporting compliance with NER CER technical standards.³⁵

Implementation of this draft recommendation would increase the information available to consumers in regard to devices and installers, enabling them to make an informed choice that is more likely to result in a CER connection that performs as expected and in accordance with the technical requirements.

4.1.2

Stakeholder views

CitiPower, Powercor, United Energy and Rheem supported a model where the CEC is responsible for installer accreditation and listing approved sellers.³⁶

³⁵ Energy Consumers Australia, for example, has information available on its website to assist consumers in selecting CER: https://www.energytechguide.com.au/?utm_medium=website%20banner&utm_source=eca&utm_campaign=plugin922 (accessed 18 April 2023).

³⁶ Submissions to the consultation paper: CitiPower, Powercor, United Energy, p. 3; Rheem p. 9.

Rheem also noted that this arrangement could be undertaken as an extension of the CEC's existing accreditation processes. However, Rheem also commented that there should be an element of random subsequent check testing to ensure continued compliance given accreditation checks can become out of date.

4.1.3

Implementation

The CEC would be responsible for implementing this draft recommendation on a voluntary basis. To do so, the CEC could extend the criteria under the NETCC framework to be listed as an approved seller to include compliance with NER CER technical standards.

As the NETCC becomes more widely known, implementation of this draft recommendation may help to highlight more reliable providers of solar retail services to potential customers.

There would be some cost of implementing this draft recommendation. However, this is expected to be marginal as the NETCC is already established with an accreditation system and this draft recommendation would have the effect of including one more element to that existing arrangement.

Success of this immediate draft recommendation relies on the reputation and reliability of the NETCC program. As noted by Rheem, it will be important for the success of the program in general, and specifically in relation to CER technical standard compliance, if there is some assurance that the accreditation standard is maintained. Noting the NETCC is new, this assurance will emerge over time.

4.2

Draft recommendation 5: Mandate CER technical standards training for SRES accreditation

The Commission's draft recommendation is that NER CER technical standards training be mandatory for accreditation under the SRES (Small-scale Renewable Energy Scheme).

The purpose of promptly implementing this draft recommendation is to improve installer familiarity with the requirements of any CER technical standards that are called up by both the NER and the SRES, such as AS 4777.2:2020. For more on the SRES, see Box 6.

This draft recommendation could be implemented on a voluntary basis by the entities administering SRES accreditation as soon as possible. These entities could provide mandatory training for installers that are already accredited such as, at present, the CEC. These costs may be relatively low in comparison to the improved compliance of new installations that may arise from the additional training and accreditation.

BOX 6: WHAT IS THE SMALL-SCALE RENEWABLE ENERGY SCHEME?

Overview of the SRES

Established under the *Renewable Energy (Electricity) Act 2000* (Cth) (the RE Act), the SRES establishes a market for small-scale technology certificates which liable entities are required

to buy and surrender to the regulator. This creates an incentive for individuals and small businesses to install small-scale renewable energy systems that are eligible for the creation of such certificates such as CER devices.

Objectives

The objectives of the RE Act are to encourage the additional generation of electricity from renewable energy sources, reduce emissions of greenhouse gases in the electricity sector, ensure that renewable energy sources are ecologically sustainable and to contribute to the achievement of Australia's greenhouse gas emission reduction targets. The SRES, and the Large-scale Renewable Energy Target, are in effect until 2030.

Requirements for CER technical standards

The RE Act requires that the regulations to the RE Act must establish a scheme for the inspection of installation of small generation units for which certificates have been created and that such regulations must provide that each year a statistically significant selection of small generation units that were installed during that year must be inspected for conformance with Australian standards and any other standards or requirements relevant to the creation of certificates in relation to that small generation unit.

The RE Regulations prescribes eligibility requirements in respect of the creation of STCs for small systems, including compliance with relevant technical standards. For example:

- CER used to create STCs must be on the CEC's 'approved products list' which is a list of compliant inverters and power conversion equipment that are approved for installation under the SRES. Products on the list must meet AS 4777.2:2020, among other technical standards
- the person who is entitled to create certificates for the unit must have obtained (if the system uses an inverter and is a grid-connected power system) a written statement by the installer that when the unit was installed, the model of inverter used in installation complied with AS 4777.2:2020.

CER devices must also comply with all jurisdictional requirements in respect of installation of the unit.

Regulatory monitoring and enforcement

The Clean Energy Regulator oversees the administration of the SRES. Its tools to assist with monitoring compliance include, but are not limited to:

- Production of serial numbers: Manufacturers and importers are required to provide serial numbers for all inverters or photovoltaic modules used in the installation of a small generation unit to the Clean Energy Regulator (or a person nominated by the Clean Energy Regulator)
- CEC approved products testing: the CEC requires that the product is tested to the AS 4777.2:2020. In order to monitor compliance on the Approved Products List, the CEC

purchases selected devices from the Australian market based on a risk analysis in addition to random selection and has them tested at testing laboratories

- If the CEC testing identifies non-compliance with the certification, the CEC may:
 - suspend or remove the listing until compliance is verified
 - suspend or remove all other device model numbers related to that manufacturer or applicant
 - notify the Clean Energy Regulator, state electrical authorities, and the industry, and/or
 - refuse to process a new application for listing until satisfactory corrective actions are complete
- Power to inspect small generation units: Under the RE Regulations, a 'statistically significant selection of small generation units', that were installed during the year are to be inspected by an inspector appointed by the Clean Energy Regulator to ensure compliance with the Australian standards and other relevant standards and/or requirements for the creation of certificates.

Source: Baker McKenzie, *Review into CER technical standards: appendix*, 27 April 2023, pp. 32-36.

4.2.1

Reasons for draft recommendation

The SRES already requires installers to comply with CER technical standards. However, despite this requirement, non-compliance rates at the installation stage to date suggest there may be some lack of familiarity with requirements among SRES-accredited installers.

The potential gap appears to be that training on AS 4777.2:2020 provides points for the SRES accreditation process, but is an optional training element rather than mandatory requirement for accreditation.³⁷

To address this, the draft recommendation would require amending the accreditation requirements so that training on AS 4777.2:2020 became mandatory for SRES accreditation. This would be an expansion of the existing accreditation process rather than creating a bespoke new process and should be a relatively simple measure to improve installer familiarity with requirements.

Implementation would be further supported by the national scope of the SRES and its existing requirement for participants to comply with AS 4777.2:2020. On this basis, there should be only a very modest additional cost involved to support installers' skills and reduce the likelihood of incorrect installations. The costs would be recovered by electricity retailers and, ultimately, consumers.

³⁷ Stakeholder meetings with the AEMC.

4.2.2 Stakeholder views

In its submission AEMO stated that CER technical standards have already been incorporated voluntarily as part of the SRES scheme's inspection program.³⁸ It also noted that the existing accreditation, penalty, and demerit regimes administered by the CEC are targeted at accredited installers and can be enhanced to capture non-compliance with the technical standards under review.

Further, AEMO regarded communication and training as important channels for installers to both understand their obligations and efficiently commission new systems. AEMO understands that currently, the CEC communicates updates to CER installers by email and requires participation in their accreditation program to be eligible to participate in the SRES scheme.³⁹ The accreditation for installers requires annual professional development, but there are otherwise minimal specifications on the required content of the continuing professional development courses undertaken. AEMO noted that there are no requirements on CER technical standards in the program. In light of this, AEMO commented that mandatory training on CER technical standards should be a minimum requirement for installers to meet their accreditation given the growing impact of their role on network and power system security.

4.2.3 Implementation

Implementation of the changes set out in this draft recommendation could be undertaken voluntarily by the entities administering SRES accreditation for the Clean Energy Regulator as soon as practicable. These entities could provide mandatory training for installers that are already accredited.

Another measure that could supplement mandating CER technical standards training for SRES accreditation is a penalty system. The CEC's installer accreditation program currently operates a 'demerit points' scheme where installers who have been found to incorrectly install a DER system 'lose' points which can eventually lead to a suspension of accreditation. This demerit points program could be extended to NER CER technical standards as a further step to encourage installers to maintain their accreditation and continue to correctly install CER devices. A reduction of points, and ultimately accreditation, may steer potential customers towards fully accredited installers as that will support STCs, which many seek to benefit from.

4.3 Draft recommendation 6: Funded training on CER technical standards for installers

The Commission's draft recommendation is that funded training be provided on NER CER technical standards for installers.

The training would assist installers in understanding obligations in installing and commissioning new systems and in this way reduce the likelihood of non-compliant installations occurring.

³⁸ AEMO, submission to the consultation paper, p. 5.

³⁹ AEMO, submission to the consultation paper, p. 6.

This training could be provided by DNSPs and/or jurisdictions, who both benefit from improved compliance with CER technical standards.

4.3.1 **Reasons for draft recommendation**

Most non-compliance with NER CER technical standards occurs during the installation process. This can be ascertained from the near-universal compliance rates of devices sold in the Australian market during batch testing by University of New South Wales and AEMO.⁴⁰

Installers and associated industry representatives have highlighted a lack of access to funded training opportunities focused on NER CERTS as one of the main reasons for non-compliance during the installation of new CER devices in the NEM.⁴¹

These two factors suggest that one action that could be taken to support improved CER device compliance rates is providing funded training to installers. When implementing these measures, it is important to consider solutions that are both cost-effective and efficient in achieving the desired outcomes. Funded training should be moderate in cost and relatively simple to implement, particularly compared with the scale of market benefits from improved compliance. That is, if implemented, the draft recommendation would only impose a modest cost on taxpayers and/or electricity consumers, but the benefits in reduced wholesale and network costs for the market are likely to be more substantial.

Furthermore, funded training for installers can help achieve a NEM-wide solution to the problem. This is because installer training on NER CER technical standards is a relatively flexible measure that can be tailored to the unique conditions in each NEM jurisdiction. As such, it can be a highly targeted solution that leads to improved outcomes for consumers and the market as a whole.

Improving installer training would also support consumers receiving accurate advice and information on CER devices and their installation as consumers often rely on installers for guidance. However, without sufficient training on requirements under the NER, there is a risk of misinformation for consumers.

4.3.2 **Stakeholder views**

Many stakeholders expressed support for implementing this recommendation. The CEC, AEMO and PIAC all expressed the importance of providing more targeted training for installers on jurisdictional and DNSP requirements from CER technical standards.⁴²

The CEC noted in its submission that additional jurisdictional or DNSP specific training is required, in addition to the training already underway by the CEC.⁴³ Furthermore, the CEC noted it is continuing to work with DNSPs, jurisdictional regulators, manufacturers and installers to develop training. PIAC further expressed support for jurisdictional reforms to support information provision and workforce training provided by DNSPs.⁴⁴

40 AEMO, submission to the consultation paper, p. 8.

41 CEC, submission to the consultation paper, p. 3.

42 Submissions to the consultation paper: CEC, p. 3; AEMO, p. 2; PIAC, p. 9.

43 CEC, submission to the consultation paper, p. 3.

4.3.3 Implementation

This draft recommendation could be implemented by DNSPs and/or jurisdictions.

If DNSPs provide training, the costs of providing the training could potentially be classified as operating expenditure recoverable through revenue determinations which are subject to AER determination. DNSPs can manage the risk of liability arising from providing training to installers via contractual mechanisms which exclude and limit the liability of the DNSP. The benefit for a DNSP to provide such training to installers operating in its area is that improved compliance of installations such that they perform as expected, will enable more effective operation of the network as well as potentially provide opportunities for more CER devices to be connected (that is, improved 'hosting capacity' for the DNSP). These benefits would be expected to outweigh the cost of a training.

Alternatively, or in conjunction with DNSPs, jurisdictions could provide training to installers. The modest cost of providing training may be consistent with government policy objectives of supporting residents to use CER devices consistent with emission reduction objectives. The relevant agencies in Victoria and Queensland have already rolled out funded training for installers on NER CER technical standards with some success.

4.4 Draft recommendation 7: Guidance on CER technical standards for installers

The Commission's draft recommendation is that the CEC, as industry body for installers, publish and make freely available guidance material for installers to enable them to configure devices to comply with NER CER technical standards.

Providing relevant material to support the correct installation of CER devices could be carried out on a voluntary basis by the CEC. The AEMC is not able to make a rule imposing an obligation on the CEC to carry out this draft recommendation.

4.4.1 Reasons for draft recommendation

NER CER technical standards are a relatively new regulatory context for installers. It is also a small part of the regulatory requirements navigated by installers in each jurisdiction, with priority being extensive electrical safety requirements.

The Commission's consultations have confirmed installation difficulties are driven more by confusion than deliberate non-compliance. Installers have noted that there is an insufficiently wide understanding of the practical steps required to configure devices from various manufacturers according to NER CER technical standards.⁴⁵

As an industry body, the CEC could implement this draft recommendation and publish material (sourced from manufacturers) that would improve information on installation details and give member installers access to material at no additional cost to them. Further, the CEC providing a more standardised and widely available information source on installation

⁴⁴ PIAC, submission to the consultation paper, p. 9.

⁴⁵ Stakeholder meetings with the AEMC.

requirements of NER CER technical standards would be a relatively low-medium cost way of providing for greater market transparency.

This approach also is a simple way of accounting for the information asymmetry between installers and the DNSPs regarding network requirements under the NER. Having this information source would aid in closing that gap and remove inefficiencies arising from material information gaps.

4.4.2 Stakeholder views

Several stakeholders informed AEMC staff of the need for greater information transparency within the CER installation space. Installers also raised the need for freely available public material that can be used when installing a CER device. As a relevant industry body, the Commission considers that the CEC is well placed to provide this material.

4.4.3 Implementation

Implementation of this draft recommendation could be undertaken by the CEC voluntarily as a form of industry self-regulation. As a relevant industry body, the Commission considers that the CEC is well-placed to implement the recommendation. It is consistent with other CEC material in support of its members, which include installers and DNSPs. The guidance material could cover, but not be limited to, advice on how to select 'Region A' and any commonly encountered barriers to installers following the correct configuration requirements for NER CER technical standards.

4.5 Draft recommendation 8: Introduce commissioning sheets for CER devices

The Commission's draft recommendation is that DNSPs introduce commissioning sheets that include step by step good practice guidance for successful installation of CER devices. The commissioning sheets should also require responses from the installer to show the DNSP and the customer that the device has been properly configured.⁴⁶

This draft recommendation aims to reduce the likelihood that devices are incorrectly installed and so not compliant with CER technical standards.

The Commission does not recommend any amendment to the NER and/or NERR to oblige DNSPs to take this action. It considers that DNSPs are not prevented by the NER or the NERR from introducing commissioning sheets and that to do so would be good practice.

⁴⁶ DNSPs have a responsibility to ensure that any new connections to the grid comply with the relevant technical standards. However, once the connection is made, DNSPs do not have control over the ongoing maintenance or operation of the customer's CER system. Non-compliance can occur due to a variety of reasons, including the use of non-compliant equipment, poor installation practices, or lack of regular maintenance. While DNSPs can advise customers and their installers on compliance requirements, ultimately it is up to the customer and their installer to ensure that the CER system complies with the technical standards before the point of connection.

4.5.1 **Reasons for draft recommendation**

AEMO has noted that most non-compliance with NER CER technical standards occurs during installation.⁴⁷ The regulatory obligation and potential liability falls on DNSPs and consumers through the connection agreement when the CER device is installed. This means that contractually, the consumer's third-party arrangements with installers represent the greatest risk to compliance. Consumers, however lack the information and resources necessary to successfully monitor installer compliance with contractual requirements.

The introduction of commissioning sheets by DNSPs would be good practice and support the broader reliability, security, and safety of energy supply for NEM consumers. Making sure a device is compliant before it is operational and grid-connected would provide DNSPs and AEMO with greater assurance that the device is compliant and will perform as expected, in accordance with the technical standards. This provides operational certainty to the DNSP and AEMO and reduces the risk of potential voltage issues. As a result, upstream impacts on broader distribution and transmission can be minimised.

The cost of establishing commissioning sheets would be borne by DNSPs. However, alternative of DNSPs and AEMO managing operations in the context of significant non-compliant CER devices with the cost of increased energy and network expenditure to mitigate non-compliance across the grid is likely to be much higher.

Included in this draft recommendation is that a copy of the commissioning sheet be provided to the customer. This should provide information to the customer about the device, installer and that compliant installation has successfully occurred.

4.5.2 **Stakeholder views**

Stakeholders did not support placing extensive obligations on consumers. AusNet, AEC, AGL, EnergyAustralia, Rheem and PIAC noted that consumers should not be responsible for compliance and obligations to rectify non-compliant installations should not be burdened on consumers.⁴⁸

NSW DNSPs stated that in terms of operational and installation issues, the majority of customers would not be aware if installations are non-compliant as there is likely to be a high reliance on the competence of the installer to ensure compliance unless this is picked up by the DNSP at the time of installation. In their view, any compliance issues the customer might have regarding the operation or installation of CER devices would be likely to be directed to the installer.⁴⁹

Several stakeholders commented that commissioning sheets would be beneficial to increasing compliance with CER devices in the NEM. AEMO, AusNet and SA Power Networks all expressed support for commissioning sheets as a way to boost compliance before the device

47 AEMO, submission to the consultation paper, p. 10.

48 Submissions to the consultation paper: AusNet, p. 3; AEC, p. 1; AGL, p. 2; EnergyAustralia, p. 1; Rheem, p. 7; PIAC, p. 9.

49 NSW DNSPs, submission to the consultation paper, p. 6.

is operational.⁵⁰ These stakeholders considered that mandatory commissioning sheets should be required by all DNSPs as part of the registration and connection process.

4.5.3 Implementation

DNSPs could voluntarily implement this draft recommendation as soon as practicable. The Commission does not consider it necessary to implement the recommendation through a rule change process as there is no barrier to DNSPs establishing a process that is suitable for their needs as indicated by the experience of CitiPower, Powercor and United Energy.

In implementing this draft recommendation, DNSPs would be responsible for issuing mandatory commissioning data sheets to installers that can be used to confirm the selection of AS 4777.2:2020 (as well as other technical requirements). The installer would then be responsible for following the guidance provided by the commissioning sheet and completing it before providing it to the DNSP and consumer.

If there are costs associated with the commissioning sheet process, operating expenditure incurred by DNSPs in implementing this initiative may be capable of being recovered through the existing regulatory revenue processes subject to the AER's determination.

This draft recommendation leverages off work carried out in Victoria with CitiPower, Powercor and United Energy having already implemented mandatory commissioning data sheets for installations in their areas in October 2022. In their submission, these DNSPs stated to address issues with solar inverter non-compliance with the CER technical standards, commissioning sheets have become a new requirement for installers within their areas.⁵¹ This requirement was introduced in the inverter installation process to ensure that an inverter was installed in accordance with Australian Standards.

Effective from 1 October 2022, all new solar connections in these DNSP areas were required to produce a commissioning sheet that demonstrated the compliance of the inverter installation with the technical standards. The introduction of the commissioning sheet was expected to make consumers more familiar with their requirements to comply with the CER technical standards. The consumers were not able to receive any feed-in tariff until their inverter settings were deemed compliant. However, this did not prevent them from generating and using solar from their new system or from exporting excess.⁵²

According to CitiPower, Powercor and United Energy, the commissioning sheet also provided a means for embedding compliance at the installation point and maintaining the onus on installers to ensure installations were correct.

Other DNSPs in different NEM regions could pursue similar initiatives as already commenced in Victoria by CitiPower, Powercor and United Energy. DNSPs would be able to create a commissioning sheet that best works for them and simplifies the process for installers working in their area.

50 Submissions to the consultation paper: AEMO p. 7; AusNet, p. 3; SA Power Networks, p. 3.

51 CitiPower, Powercor and United Energy, submission to the consultation paper, p. 2.

52 CitiPower, Powercor and United Energy, submission to the consultation paper, p. 2.

5 STAGE THREE: SUPPORT ONGOING COMPLIANCE

The third stage in the life cycle of a CER device is ongoing operation. This chapter explains the Commission's draft recommendations for supporting ongoing compliance once devices have been connected to the distribution network.

The Commission's high-level estimate is that implementation of all the draft recommendations for immediate action during the ongoing operation of CER devices would contribute to between 23 per cent and 55 per cent of the overall estimated improvement in compliance for new connections.⁵³

BOX 7: DRAFT RECOMMENDATIONS AT THE ONGOING OPERATION STAGE

Draft recommendation 9: Retailers to accelerate the deployment of smart meters with improved data access for DNSPs to monitor compliance with NER CERTS.

Draft recommendation 10: OEMs to provide data to DNSPs and AEMO to better support monitoring of non-compliance.

Draft recommendation 11: DNSPs to develop and follow a defined process for contacting customers suspected of non-compliance and explaining options for returning to compliance.

Draft recommendation 12: Jurisdictions to subsidise re-configuration, remote update or re-installation of non-compliant CER devices on behalf of consumers.

5.1 Draft recommendation 9: Accelerated smart meter deployment with improved data access

Through the review of the regulatory framework for metering services (the metering review), the Commission has made draft recommendations to accelerate the deployment of smart meters.⁵⁴ The metering review's draft recommendation includes support for improved data access for DNSPs, consumers, and other market participants to support consumer outcomes.

The Commission makes a draft recommendation in this review in support of an accelerated deployment of smart meters because it enables improved compliance with CER technical standards.

Smart meters are an important tool to support ongoing compliance with CER technical standards. This is because the data generated by smart meters can provide DNSPs with an improved insight into devices connected to the network to assist in detecting and addressing non-compliant connections. For this reason this review, along with the metering review, is

⁵³ Added across all three stages in the device lifecycle, the total estimated market impact of draft recommendations exceeds 100 per cent. This reflects significant uncertainty about the actual level of compliance that would follow from the implementation of each draft recommendation.

⁵⁴ AEMC, *Review of the regulatory framework for metering services*, 3 November 2022.

supporting an accelerated deployment of smart meters (beyond Victoria) with improved data access.

Specifically:

- there is a need to accelerate the deployment of smart meters across the NEM (beyond Victoria) to support DNSPs in discharging their obligations, including taking action to improve CER device compliance more effectively and sooner
- there is a further benefit to AEMO as the market operator to access the increased data on compliance rates with CER technical standards that would be generated through an accelerated deployment of smart meters.

For more on the AEMC's review of metering services, see appendix E.

5.1.1 **Reasons for draft recommendation**

Non-compliance with AS 4777.2:2020 is typically not detected by the customer. Rather, data derived from smart meters is the main way in which DNSPs and AEMO detect non-compliance. However, for DNSPs and AEMO to obtain a good understanding of CER technical standard compliance through smart meters, more smart meters are needed. Outside of Victoria there is only a limited deployment of the advanced metering infrastructure necessary to support this data collection that will enable action to improve compliance to be taken.

In this way, the accelerated deployment of smart meters envisaged by the metering review's draft recommendations is also important for DNSPs' ongoing monitoring of non-compliance with NER CERTS. Smart meter data would reveal local voltage conditions relative to individual CER device's net performance which can otherwise be missed by current monitoring or never tested by local voltage set points. This would help to improve transparency of CER device compliance with CER technical standards and enable DNSPs to contact non-compliant consumers and assist in the rectification of the non-compliant device efficiently and effectively.

5.1.2 **Stakeholder views**

Some stakeholders expressed support for accelerating the smart meter deployment to be able to achieve greater access to CER device data. AusNet, NSW DNSPs, SA Power Networks and the CEC all expressed interest in an accelerated smart meter deployment with sufficient data access to support monitoring by DNSPs.⁵⁵ The CEC noted that it supports this data provision only if DNSPs are responsible for compliance.⁵⁶

5.1.3 **Implementation**

The draft recommendation for this review is consistent with, and builds on, the direction of recommendations in the AEMC's review of the regulatory framework for metering services. Further work on this issue and how it can be implemented will be developed through the remaining metering review process.

⁵⁵ Submissions to the consultation paper: AusNet, p. 2; NSW DNSPs, p. 7; SA Power Networks, p. 4; CEC, p. 3.

⁵⁶ CEC, submission to the consultation paper, p. 3.

5.2 Draft recommendation 10: Access to OEM compliance data

The Commission's draft recommendation is that OEMs provide CER device compliance data to DNSPs and AEMO. Such data would enable DNSPs and AEMO to better monitor compliance with CER technical standards and therefore be in a better position to take action to rectify the identified non-compliance.

This draft recommendation can be carried out voluntarily by OEMs (the Commission's rule-making powers do not extend to OEMs) and would supplement data derived from smart meters.

5.2.1 Reasons for the draft recommendation

Some CER device manufacturers have the ability to remotely monitor the performance of devices including device compliance with CER technical standards after installation. In some circumstances, OEMs are also able to update device settings to rectify non-compliance with CER technical standards. There is, however, no express requirement or incentive for OEMs to share monitoring data with DNSPs and AEMO or to update device configurations to comply with NER CERTS.

The immediate implementation of this draft recommendation would improve access to compliance data and therefore increase the transparency of information about CER devices to DNSPs and AEMO. This would support DNSPs in operating distribution networks safely, securely, and reliably in real-time. Access to OEM data also provides DNSPs and AEMO with a better understanding of where non-compliance with CER technical standards is occurring. It provides DNSPs with the opportunity to take targeted action to rectify any issues — especially in areas of the network where non-compliant devices are not tested by local voltages. Consequently, OEM data can assist to improve compliance rates and the overall performance of CER devices at a network level as well as for individual consumers.

There are potential limitations with the ability of this draft recommendation to improve compliance due to its voluntary nature. The Commission acknowledges that some OEMs have already been working with DNSPs and AEMO to share relevant information with those organisations for the purposes outlined in this section. While some OEMs may have elected not to engage in this, others do not have CER devices that provide data to OEMs remotely.

Consideration of regulatory reform is needed before more direct requirements on OEMs might be considered under regulatory frameworks. For more on progressing regulatory reform, see chapter 6.

5.2.2 Stakeholder views

In its submission, SwitchDin suggested that to assist DNSPs monitor compliance with CER technical standards, there should be no regulatory barriers to DNSPs requiring data from OEMs to verify compliance of the OEM's fleet of inverters.⁵⁷ It further noted the Commission should not specify how OEMs should obtain data; nor should it prevent DNSPs from

⁵⁷ SwitchDin, submission to the consultation paper, p. 6

prescribing how OEMs should collect data. SwitchDin suggested allowing industry to solve the challenge of verification and reporting at least cost, within the limits of customer privacy and informed consent.

AEMO noted in its submission that OEMs have access to much of this data already, which can be readily shared with DNSPs if they choose to.⁵⁸ It noted that this would be an efficient measure in helping DNSPs monitor compliance.

5.2.3 Implementation

To implement this draft recommendation, OEMs would be responsible for providing access to CER device data to DNSPs voluntarily. Pending the continued deployment of smart meters, the Commission expects this real-time operational data would support DNSPs ongoing monitoring of compliance for operational devices and enable them to take steps to rectify non-compliance issues with devices.

Providing CER device data to DNSPs to improve compliance with CER technical standards is also consistent with supporting AEMO's operations and planning of the NEM.

While implementing this draft recommendation may provide DNSPs with more detailed data on individual non-compliant inverters, absent regulatory reform to require such information sharing, its success will depend on OEMs and DNSPs working together on a voluntary basis.

5.3 Draft recommendation 11: Defined process for contacting consumers

The Commission's draft recommendation is for DNSPs to develop and follow a defined process for contacting customers suspected of non-compliance and also explaining options for returning to compliance.

This draft recommendation seeks to improve DNSP-consumer relations by making the DNSP the first point of call with the consumer if the CER device is non-compliant. The Commission proposes that the draft recommendation would not require a change to the NER or NERR because under existing frameworks, DNSPs are able to contact consumers about a non-compliant device in order to rectify it.

5.3.1 Reasons for the draft recommendation

Compliance with NER CER technical standards is a requirement arising through the connection agreement between consumers and the DNSP. As such, DNSPs are in practice typically the only party to the agreement able to detect non-compliance and understand its significance for the connection and the broader power grid. Several DNSPs however, report difficulties and costs from notifying customers on an ad-hoc basis.⁵⁹ This experience is consistent with DNSPs not being, historically, responsible for extensive interactions with consumers.

⁵⁸ AEMO, submission to the consultation paper, p. 7.

⁵⁹ NSW DNSPs, submission to the consultation paper, p. 6.

However, innovation underway in Victoria from CitiPower, Powercor and United Energy is seeing initial success in streamlining DNSPs' communications with consumers.⁶⁰ This suggests that some changes to how DNSPs manage their relationship with CER owning consumers is feasible.

The Commission expects that implementing this draft recommendation would improve consumer outcomes by providing a more streamlined and considered approach for communicating for consumers with non-compliant connections. Consumers could then discuss clearly defined options for rectifying non-compliant devices with their DNSP, potentially in conjunction with other measures put forward as draft recommendations in this report.

5.3.2 Stakeholder views

In its submission, PIAC noted that DNSPs remain the most efficient focus point for compliance and enforcement of effective CER technical standards, particularly at the point of installation.⁶¹ Given this, PIAC considered that DNSPs should have a greater role of contacting consumers to help rectify non-complaint installations.

Further to this, AusNet, AEC, AGL, EnergyAustralia, Rheem and PIAC noted that consumers should not be responsible for compliance and obligations to rectify non-compliant installations should not be burdened on consumers.⁶² These stakeholders called on a greater role for DNSPs in monitoring compliance and ensuring that clear communication is received by consumers in an attempt to rectify non-compliant devices.

5.3.3 Implementation

This draft recommendation could be implemented immediately by DNSPs voluntarily establishing defined processes and information to improve consumer contacts regarding CER devices and their compliance with CER technical standards. DNSPs are currently able to develop and follow a defined process for contacting customers suspected of CER device non-compliance and explaining options for returning to compliance. Any costs incurred by the DNSP could potentially be recoverable through operating expenditure through a DNSPs revenue, subject to the AER's determination.

5.4 Draft recommendation 12: Subsidised re-configuration of non-compliant devices

The Commission's draft recommendation is that jurisdictions consider the option of subsidising the re-configuration of non-compliant CER devices. The purpose of implementing this draft recommendation would be to relieve the burden on consumers to ensure their device is non-compliant. It would also support improving CER device compliance with technical standards.

60 CitiPower, Powercor and United Energy, submission to the consultation paper, pp. 2-3.

61 PIAC, submission to the consultation paper, p. 11.

62 Submissions to the consultation paper: AusNet, p. 3; AEC, p. 1; AGL, p. 2; EnergyAustralia, p. 1; Rheem, p. 7; PIAC, p. 9.

5.4.1 **Reasons for the draft recommendation**

There is currently no financial incentive for consumers to rectify non-compliant installations even following an approach by DNSPs. Without consumer action, however, it is difficult to return devices to compliance with the CER technical standards. This difficulty is particularly pronounced for devices that have already been installed and are operational.

The existing contractual remedy for non-compliance is to disconnect the consumer.⁶³ However, the Commission generally considers this to be a disproportionate response and acknowledges the practice of DNSPs to date in largely avoiding recourse to this option.

In this context, the Commission has considered whether there are other approaches to improve CER technical standard compliance of existing devices. Noting that there are broader benefits from improved device compliance, the costs to jurisdictions from supporting the re-installation of non-compliant devices would likely be substantially outweighed by the market benefits of increasing compliance. However, individual jurisdictions would need to confirm the economic merits of this intervention in light of local conditions prevailing at the time. For more on the market impact of non-compliance, see appendix A.

5.4.2 **Implementation**

To implement this draft recommendation, jurisdictions could voluntarily establish programs to subsidise the re-configuration or re-installation of non-compliant CER devices on behalf of consumers. The Commission's rule-making powers do not extend to placing obligations on jurisdictions.

After the customer has been contacted about the non-compliant device, DNSPs would (consistent with draft recommendation 11 section 5.3) explain to consumers the need for re-installing, re-configuring, or otherwise updating the device. Leveraging this approach, a DNSP would also be able to refer the consumer to a program administered at the jurisdictional level to support a return to compliance with CER technical standards in the NER at negligible cost to the consumer.

The re-installation or re-configuration of the device can be subsidised by jurisdictions outside the NER and its associated economic regulatory processes for DNSPs. While the Commission considers that there are benefits for this approach that can be considered by jurisdictions, the details of any program should be tailored to the needs and circumstances of the jurisdiction.

⁶³ Baker McKenzie, *Review into CER technical standards*, appendix, 27 April 2023, pp. 5-6.

6 PROGRESSING REGULATORY REFORM

BOX 8: DRAFT RECOMMENDATION TO PROGRESS REGULATORY REFORM

Draft recommendation 14: Jurisdictions, with the AEMC, AEMO and AER, progress work to consider the options and viability of reforming the national regulation of CER technical standards.

6.1 Draft recommendation 13: Progress reform of national regulation

This chapter sets out:

- a description of this draft recommendation which provides detail on what is required by the energy market bodies and jurisdictions to progress regulatory reform of CER technical standards
- reasons for making this draft recommendation and why this is consistent with the energy objectives
- stakeholder views
- how the AEMC intends to progress this reform in this review.

6.1.1 Description of draft recommendation

Draft recommendations one to 12 for immediate action have been designed to simplify and make more transparent efforts to improve compliance rates of CER devices with CER technical standards.

However, after a reasonable implementation period, more analysis should be undertaken by jurisdictions and energy market bodies to determine if these voluntary efforts are sufficient or if residual non-compliance will require further regulatory reform.

Accordingly, the Commission considers more work is needed to determine if reform of national technical regulation is needed and, if so, the most appropriate reform model. This work can be broken into four tasks:

1. identifying the need for new regulatory functions — the specific tasks or responsibilities necessary to bring stakeholders and frameworks together
2. defining and consulting on regulatory options to address identified gaps and needs
3. clarification of implementation requirements
4. assessment of the costs and benefits of reform options.

These are discussed in turn below.

Task 1: Identify the need for new regulatory functions

The first task in progressing regulatory reform is to identify specific functions that should be undertaken by a new (or existing) regulator. That is, why might a new technical regulator be

needed? This requires identifying gaps in the existing regulatory framework. This can be done by considering the question of what regulatory functions are not presently covered by national regulatory frameworks such as the AEMC's rule-making activities, the regulatory enforcement activities of the AER, and AEMO's powers as the market operator. To obtain a full understanding, this task should also include consideration of the regulatory functions of jurisdictions (including the Commonwealth) relevant to CER technical standards.

This review's immediate draft recommendations provide an indication of existing gaps (see earlier chapters). Draft recommendations one to 12 cover parties and activities across the lifecycle for CER devices. However, implementation has focused on voluntary actions or suggestions for third-parties to act upon. For example, there are no direct obligations proposed for OEMs and installers, despite manufacturing and installation representing two of the three stages in the device lifecycle. As explained in earlier chapters these limitations are due, in part, to the AEMC's limited jurisdiction to prescribe obligations only in respect of NEM participants. To date, for CER technical standards, the Commission has only made rules in relation to DNSPs with obligations introduced through the model standing offer for micro-embedded generation units and requiring DNSPs to publish information about the safety and technical requirements applicable under energy laws to small generators.⁶⁴

It follows from this limitation of the NEL that an option for future regulatory reform could aim to address all those functions and parties not covered directly by immediate draft recommendations. What activities are not envisaged as mandatory under the immediate draft recommendations? Jurisdictions could commit to reforming regulatory frameworks mandate compliance with technical standards backed by enforcement powers.

However, identifying regulatory gaps is only one aspect of identifying the need for new regulatory functions. The second aspect is to consider if these gaps need to be 'filled' through new regulatory functions. The need for any new regulatory functions will depend on the effectiveness of immediate draft recommendations — how much 'residual' non-compliance with CER technical standards would remain following implementation of the immediate recommendations from this review?

Once residual non-compliance is determined, the cost of particular reform options can be compared to the benefits from addressing residual non-compliance. This analysis would indicate if the immediate draft recommendations prove largely effective in improving compliance, there may only be marginal benefits from pursuing further improvements. If this were to be the case then such marginal benefits for consumers may not justify new regulatory functions to be developed through reforms to national technical regulation. For more on the need to consider the costs and benefits of each reform option, see Task 4 below.

Further gaps in the existing regulatory framework, beyond those expressly identified by this draft report, may also be identified by jurisdictions, market bodies, and from the report by Baker McKenzie on the regulatory frameworks relating to enforcement and compliance of CER technical standards.⁶⁵

⁶⁴ AEMC, *Distributed energy resources technical standards*, rule determination, 25 February 2021.

⁶⁵ See appendix B for further information.

Task 2: Define and consult on regulatory options

The next task is to define and consult on options for regulatory reform. There are at least three reform options that could be considered by jurisdictions:

- *Option one: maintain the status quo*

This would involve no reform to the existing scope and functions of existing regulators without any interconnection between the various organisations or oversight of an overarching policy. For example, at the national level, the AER and the Clean Energy Regulator would continue in accordance with existing roles and responsibilities and AEMO would continue its efforts monitoring non-compliance and assessing the consequences for the power grid. In addition, those activities carried out by jurisdictions would also continue at the discretion of those jurisdictions.

- *Option two: reform existing organisations*

One way to reform national regulation would be to change the scope and functions of one or more existing regulatory organisations. For example, this could involve:

- expanding or otherwise modifying the AER's functions to better support compliance
- expanding or otherwise modifying the functions of the Clean Energy Regulator
- merging and/or bringing together the relevant functions of the AER's and the Clean Energy Regulator's CER compliance and enforcement roles.

Alternatively, reform of existing organisations could involve expanding or bringing together the functions of agencies created under the legislative frameworks for individual states and territories. However, to date, stakeholders have not proposed improving compliance by relying on individual jurisdictional frameworks — instead, the preference has been for more nationally consistent regulation.⁶⁶ The Commission notes reform at the national level provides the opportunity for national (or NEM) consistency that jurisdictional-focused reforms may not. This is preferable primarily due to Australia's position as an importer of CER devices. Further fragmentation of device requirements at the jurisdictional level would risk reducing the range of devices available for local consumers.

- *Option three: create a new national regulator*

A third option to reform national regulation would be to create a new technical regulator for CER technical standards. This would involve creating a new entity to support compliance with, and enforcement of, CER technical standards.

Absent further reform, such as the transfer of functions from existing jurisdictional regulators, this would mean creating an additional regulatory framework for CER technical standards. This would create new interactions across an already complex and overlapping regulatory context for CER (for more, see appendix B).

Assessing each of the above options, and any others that are identified, will depend on how the cost of its implementation would compare with the benefits from addressing residual

⁶⁶ See, for example, written submissions in response to the consultation paper: AEMO, the CER, and Tesla.

non-compliance. Another consideration will be the anticipated effectiveness of each specific option compared with alternative approaches.

Task 3: Clarify implementation requirements

Each reform option will entail implementation requirements. For example, reforming existing bodies or creating a new national regulator is likely to require:

- Agreement among jurisdictions with sufficient scope to introduce the preferred approach — the AEMC, for example, is limited to making rules within the existing bounds of the NEL and NERL. Absent additional reform, the AEMC could not confer any regulatory functions or activities on persons that fall outside our existing rule-making scope.
- Legislative amendment by the Commonwealth and, potentially, state and territory governments
- A commitment of ongoing funding by the Commonwealth and/or state and territory governments
- Consideration of potential industry contributions to meet the cost of additional regulatory functions.

It is likely that the funding needed to create a new entity would be higher than the cost of expanding or bringing together functions of existing entities relating to CER compliance and enforcement. However, this is a high-level assessment only. Costs would vary substantially depending on the specific model of regulatory reform agreed by jurisdictions and the scope of the new agency.

There would be no implementation requirements or costs to maintain the status quo. This approach simply involves a continuation of existing governance arrangements for CER technical standards. However, this option has the cost that it would not address concerns raised by stakeholders regarding the current fragmented nature of oversight of technical standard compliance.

Task 4: Assess the costs and benefits of reform options

Finally, jurisdictions will need to determine the net benefit from any reform option under consideration. This will require comparing the:

- general benefits from addressing any 'residual' non-compliance with CER technical standards (a 'fixed' benefit common to each reform option)
- specific benefits from pursuing certain reform options (compared with alternative approaches)
- cost of each reform option, including:
 - the need for jurisdictions to commit ongoing funding to support new and expanded regulatory functions
 - potential costs that may be levied from industry to support the new arrangements
 - any additional costs for consumers, if a new entity is created, from complexities arising from interactions between multiple frameworks for CER technical standards.

If the further reform options have net benefits for consumers, and there is a preference for a national approach to CER compliance is agreed, then jurisdictions will need to work through the identified implementation requirements and align their CER frameworks with the national framework.

6.1.2 **Reasons for the draft recommendation**

There are three key reasons the Commission has made a draft recommendation to progress reform of national regulation as described above.

1. *Good regulatory practice requires simplicity and transparency*

As this review has progressed, it has become clear there are gaps in the current regulatory framework which are contributing to significant non-compliance with existing CER technical standards. Such gaps are likely to cause similar problems for any future standards introduced in the NER and through other regulatory frameworks. Encouraging, in the meantime, more immediate action to be taken under the current regulatory framework reflects an acknowledgement that more significant reform action can be difficult, time-consuming and potential costly. Nevertheless, it should be considered if circumstances prove it necessary and other, less costly actions, have not achieved the objective of improved technical standards compliance to support better CER integration for the benefit of consumers and the NEM.

2. *Need to consider cost and complexity of reform*

Any reform of national technical regulation will entail varying degrees of cost and complexity for consumers. While these costs and complexities will vary depending on the specific reform model under consideration, net benefits for consumers will ultimately be needed to justify any reform. Accordingly, the work proposed under this draft recommendation is needed to consider the full range of options for reform. The preferred approach, after extensive consultation, may be the creation of a new national regulatory agency for CER technical standards. However, at present, the net benefits of this option are not clear. This is why the draft recommendation recognises further exploration of which model of reform might represent the best long-term value for consumers to justify implementation.

3. *Reform could support decarbonisation*

The final key reason in support of progressing work on long-term reform is to recognise that CER is an important part of Australia achieving its emissions objectives. CER technical standards are picked up under several regulatory frameworks, including the Commonwealth's SRES. This is in recognition of the substantial contribution to decarbonisation by individual consumers installing and maintaining CER devices such as rooftop PV and battery energy storage systems. To the extent reform of the compliance framework for technical supports greater adoption of new CER devices and improved experiences for consumers, this is likely to support the electricity sector's continuing decarbonisation efforts.

These reasons align with the assessment framework for this review. In this way, this draft recommendation is consistent with the NEO and the NERO. For more on the promotion of energy objectives, see appendix D.

6.1.3

Stakeholder views

In response to the consultation paper, some stakeholders suggested creating a national technical regulator for technical standards.⁶⁷ This idea has been proposed to improve compliance with, and enforcement of, CER technical standards in the NER. The proposal is understandable in the context of significant non-compliance with existing standards and its consequences for NEM consumers (for more, see chapter 1 and appendix A). It is also relevant to any future technical standards.

However, to date, there is little consensus on the model, functions, and implementation approach for such an entity. Implementation of this draft recommendation is intended to provide a framework through which to consider the issues raised and greater clarity in response, accounting for residual non-compliance after implementation of the immediate draft recommendations.

6.1.4

Next steps

Stakeholder feedback on this draft recommendation and plan outlined above will be reflected in the final report for this review, due to be published in mid-2023.

Beyond the conclusion of this review, the AEMC will work with jurisdictional officials on how to progress reform of national technical regulation. This approach is consistent with the AEMC's ongoing work plan for technically integrating CER.⁶⁸

⁶⁷ Submissions to the consultation paper: AEMO, CEC, and Tesla. In addition, several more stakeholders expressed an interest in at least considering the creation of a national technical regulator in discussions with AEMC staff.

⁶⁸ AEMC, *Governance of distributed energy resources technical standards*, rule determination, 17 March 2022.

ABBREVIATIONS AND DEFINED TERMS

AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AS	Australian Standard
CEC	Clean Energy Council
CER	Consumer energy resources
CERTS	Consumer energy resources technical standards
Commission	See AEMC
CSIP	Common smart inverter profile
DER	Distributed energy resources
DNISP	Distribution network service provider
ECA	Energy Consumers Australia
ESB	Energy Security Board
EV	Electric vehicle
FCAS	Frequency control ancillary services
NEL	National Electricity Law
NEM	National electricity market
NEO	National electricity objective
NER	National Electricity Rules
NERR	National Energy Retail Rules
NERL	National Energy Retail Law
NERO	National energy retail objective
NETCC	New energy tech consumer code
OEM	Original equipment manufacturer
PIAC	Public Interest Advocacy Centre
SRES	Small-scale renewable energy scheme
STCs	Small-scale technology certificates

A TECHNICAL ASSESSMENT OF THE MARKET IMPACTS OF NON-COMPLIANCE

As discussed throughout this report, stakeholder consultation has confirmed there are reasons for non-compliance across three distinct stages in the life cycle for CER devices — manufacture and supply, installation, and ongoing operations. The Commission has considered the market impacts of significant non-compliance across the NEM, NT, and WA. The draft recommendations in this report are necessary to account for and address market impacts which affect all customers. These market impacts are:

1. less secure and reliable bulk transmission system
2. reduced ability to connect new CER export
3. upward pressure on power prices.

The Commission has, at this stage, undertaken a predominantly qualitative assessment of market impacts. This is set out in more detail below.

The final report will progress this analysis by including, to the extent possible, quantification of these impacts (draft methodologies have been set out in the boxes below). This will support an assessment of the net benefits from proposed reforms. Stakeholder feedback in response to the qualitative assessment in this draft report is welcome to inform this further analysis.

A.1 Operational impacts

Widespread inverter non-compliance with the fault ride-through requirements in AS4777.2:2020 can create generation contingency risks in the event of disturbances in the power system (and particularly voltage disturbances).⁶⁹ This is because non-compliant inverters are susceptible to tripping (or 'shaking off') during disturbances where compliant inverters would ride through the power system disturbance and stay online.

Individually, a non-compliant inverter that trips during a disturbance has negligible impact to the system. However, the aggregate effect of inverter shake-off poses a system security risk if the volume of non-compliant inverters is large; at scale, for instance, it is akin to one or more large generators tripping.

BOX 9: ESTIMATING MARKET IMPACTS OF NON-COMPLIANCE DUE TO CREDIBLE CONTINGENCIES

FCAS contingency raise cost impacts:

1. Estimate and forecast the potential volume of PV inverter shake-off from deep faults at the largest generating stations in each region, e.g., Kogan Creek, Eraring, Loy Yang, etc.

⁶⁹ AEMO, *Behaviour of distributed resources during power system disturbances*, May 2021.

2. Based on market modelling with a 30-min resolution over a study period from now to 2030, determine the largest credible risk with and without PV inverter shake-off.
3. Determine the additional volume (if any) of FCAS Contingency Raise required for each 30-min interval over the study period
4. Estimate a range of additional costs for FCAS Contingency Raise due to CER technical standards non-compliance.

Reduction in interconnector transfer limits:

1. Based on market modelling with a 30-min resolution over a study period from now to 2030, determine wholesale market prices across the NEM with and without PV inverter shake-off, e.g., by applying the relevant interconnector constraint equations.
2. Estimate the costs of CER technical standards non-compliance due to the reduction in interconnector transfer limits.

Source: AEMC.

A.1.1

There are direct market impacts due to credible contingencies

In the worst case, a deep fault on a generator step-up transformer causes not only the generator to trip, but also CER to shake-off. Faults on generator step-up transformers are considered to be credible contingencies and CER technical standards non-compliance acts to exacerbate and increase the size of contingencies. For example, a transformer fault could lead to the tripping of a 300 MW generator and also cause 200 MW of PV inverters to shake off, leading to a total contingency size of 500 MW.

In some scenarios, the combination of large generator trips along with PV inverter shake-off can lead to contingency sizes that become the largest credible risk in the NEM. This has a direct impact on FCAS contingency raise volumes, which need to be increased to cover the combined generator and CER contingency.

The credible loss of CER through PV inverter shake-off is also emerging as a significant factor for reducing interconnector transfer limits in South Australia and Victoria. For example, the SA-VIC Heywood interconnector constraint equation 'V::S_NIL_MG_PP_2-DS' has a term for rooftop PV shake-off in South Australia on the RHS of the constraint equation with a coefficient of -1. This means that there is a direct one-for-one reduction in Heywood interconnector transfer capacity for every 1 MW of PV inverter shake-off that is estimated.

A.1.2

Non-compliance can increase the severity of non-credible contingencies

By their very definition, non-credible contingencies are supposed to be rare but can have significant impacts such as customer load shedding. CER technical standards non-compliance can potentially increase the severity of impacts from non-credible contingencies. For example, the Callide C4 explosion and fire in May 2021 triggered a cascading series of events the ultimately led to the separation of Queensland from the rest of the NEM and under-

frequency load shedding (UFLS) in the region.⁷⁰ Over 100 MW of rooftop PV inverter shake-off in Queensland was observed during the incident, and while it was not the critical driver for load shedding, it did exacerbate the active power imbalance that led to UFLS activation. It is conceivable that if CER technical standards non-compliance was not addressed and allowed to persist, PV inverter shake-off could drive an otherwise contained non-credible contingency into UFLS.

A.1.3 **Transmission network outage planning and maintenance impact**

The risk of non-compliance with CER technical standards can affect outage planning and maintenance for major transmission corridors. AEMO currently considers the impact of rooftop PV inverter shake-off in the stability limits associated with several network outage conditions, e.g., outages on the Heywood interconnector that lead to a credible risk of South Australia separation. This includes limits on the total volume of non-compliant rooftop PV generation in South Australia that can be managed under outage conditions. There are already material portions of the year when rooftop PV generation exceeds these limits, thus reducing the window of opportunity for ElectraNet and AusNet to schedule maintenance or upgrade works on sections of the interconnector.

When rooftop PV generation is forecast to exceed the limits, AEMO cannot allow a planned outage to proceed, thus any outages scheduled for the day must be cancelled. Since it is difficult to forecast solar irradiance levels weeks or months in advance, planned outages are often cancelled at short notice. There are direct costs to cancelling a planned outage at short notice that is borne by the transmission network service provider, e.g., it may not be feasible to reallocate maintenance crews on standby to other activities. There is also an indirect socialised cost of not properly maintaining network assets, e.g., a higher risk of asset failure.

As noted in AusNet's submission to the consultation paper, planned maintenance work on the Heywood interconnector has:⁷¹

been delayed for more than two years due to CER-related risks, costing approximately \$1 million in cancelled outages and putting increased pressure on the performance of the interconnector.

In addition to the impacts on planned outages, there are also impacts associated with unplanned outages of specific network assets. As mentioned above, under certain network outages, there are limits on the total volume of non-compliant rooftop PV generation that need to be respected. If an unplanned outage occurs, AEMO may need to curtail rooftop PV generation to remain within limits, which has a direct cost to consumers (i.e., the owners of curtailed CER), as well as to the wholesale energy market.

⁷⁰ AEMO, *Trip of multiple generators and lines in Central Queensland and associated under-frequency load shedding on 25 May 2021*, October 2021.

⁷¹ AusNet, submission to the consultation paper, p. 1.

A.2 Connection and export of CER impacts

As discussed previously in section 2.2, CER technical standards non-compliance with AS4777.2:2020 can effectively reduce the CER hosting capacity of distribution feeders to connect new CER or maximise allocation of spare export capacity with existing CER customers.

The continuing increase in customer exports means parts of the distribution network are reaching their limits to accept further exported energy. Currently these limits are static or fixed and are set based on maintaining integrity in all network conditions including during peak net export times (representing worst-case scenarios), which rarely occur.⁷²

While the current approach can be overly restrictive and lead to excessive amounts of customer exports being curtailed, export limits are exacerbated by CER non-compliance. Non-compliant CER means DNSPs need to be more conservative and limit the amount or size of new CER connected to the distribution feeder, because the DNSP would need to protect network feeders and transformers. Stakeholders have provided the following customer implications:⁷³

- existing CER customers are constrained even further than what the physical limits of the system require for the time.
- non-compliant CER may curtail other correctly set installations.
- intending CER customers may be 'crowded out' from installing CER or installing smaller units.
- customers can export less solar than they otherwise would, potentially slowing the payback for their solar investment and less supply in the wholesale market overall.

Dynamic operating envelopes will provide a more efficient approach to managing network capacity by allowing DNSPs to vary customer export limits dynamically: allowing customers to export more electricity and limit exports only when necessary. Increased compliance with AS 4777.2:2020 would increase available export capacity, support greater access to customer generated renewable energy without the costs of major network upgrades, while maintaining current reliability, security, safety and quality of supply.

BOX 10: ESTIMATING MARKET IMPACTS OF NON-COMPLIANCE ON CONNECTION AND EXPORT OF CER

Starting with a working assumption that compliance with CER technical standards would increase available hosting capacity at a decreasing rate, meaning that compliance has a positive yet diminishing impact on hosting capacity as compliance rates increase, but is still important for maximising hosting capacity, then:

⁷² Network limits have historically been based on an estimate of diversified maximum or minimum demand conditions that may only occur on the network for 1-5% of the year.

⁷³ Submissions to the consultation paper: AER, p. 2; CitiPower, Powercor, United Energy, p. 3; NSW DNSPs, p. 5; PIAC, p. 5; Rheem, pp. 3, 6; SAPN, p. 2.

1. Determine the number and location of intending CER customers, installed export capacity, and intrinsic hosting capacity for a given feeder.
2. Estimate export capacity versus constraints due to non-compliance.
3. Compare the estimated export capacity with the export hosting capacity to identify the constrained CER customers and crowded out intending CER customers caused by non-compliance.
4. Calculate the revenue loss and additional payback time for the solar investment based on the reduced export capacity due to non-compliance.

Source: AEMC.

A.3 Customer bill impacts

If CER technical standards non-compliance were to continue at current trends, it is possible for customer bills to be impacted in two ways:

1. higher dependence on wholesale electricity
2. increased operational expenditure and augmentation expenditure by DNSPs.

A combination of short-term reforms to address CER technical standards non-compliance could help push down power bills for all consumers — and the qualitative benefits of increased compliance are expected to outweigh the potential costs of intervention. Customer bill impacts from higher wholesale price dependence and increased network spend could be markedly avoided with increased compliance.

BOX 11: ESTIMATING MARKET IMPACTS OF NON-COMPLIANCE ON CUSTOMER BILLS

Increased dependence on wholesale electricity:

1. Estimate the amount of constrained exports due to non-compliance relative to the additional electricity demanded from constrained CER customers.
2. Estimate the bill impact to all customers based on historical data or market projections of wholesale electricity prices.

Increased network spend:

1. Estimate the proportion of expenditure allocated to CER non-compliance, e.g., transformer or conductor upgrades.
2. Determine the cost pass-through rate of a given tariff structure of network charge.
3. Estimate the impact of increased network spend due to non-compliance for CER and non-CER customer bills.

Source: AEMC.

A.3.1 Higher dependence on wholesale electricity

One of CER's key consumer benefit is self-generation of electricity and potential revenue of export excess to the grid. Non-compliance with CER technical standards may mean that customers' exports may be curtailed in the middle of the day due to network constraints, losing potential cost-savings of self-generation and energy usage at this time. Later in the day, grid conditions may prevent more of their low marginal cost exports being put back into the grid.

Non-compliance will constrain and curtail CER much more than is required. This has the potential to increase all customers' dependence on consuming wholesale generated electricity. This could occur impact customer bills in two ways:

1. Constrained or curtailed CER exports due non-compliance would mean CER customers are unable to maximise exports net of consumption — they will have to purchase more electricity from the wholesale market to meet their demand.
2. With less CER customers as net-exporters, and demanding more from the wholesale pool, the price for all customers may modestly increase.

A.3.2 Increased operational expenditure and augmentation expenditure by DNSPs

The standard AS 4777.2:2020 requires the volt-var response mode to be enabled by default. This means that compliant inverters are configured to monitor and support local voltages and non-compliant inverters are largely indifferent to local voltages.⁷⁴

Distributed voltage control by PV inverters operating in volt-var response mode is an efficient way to maintain distribution voltages within network power quality compliance limits. This is particularly important at the ends of distribution feeders that have high penetrations of CER, where high voltages at the upper edges of the allowable voltage range have been observed in many jurisdictions.

Without widespread CER technical standards compliance, distribution voltage levels would need to be managed through a variety of operational and planning measures, including:

- limiting the installed capacity of CER on a feeder, for instance, capped to a feeder's CER hosting capacity
- dynamically limiting the output of CER via dynamic operating envelopes or volt-watt response modes (using active power output instead of reactive power to control voltages)
- adjusting the distribution or zone substation transformer tap positions, though this option can quickly become impractical and costly if many adjustments are required since the transformer can also run out of tap positions
- augmenting the network by upgrading transformers and/or conductors
- managing the timing of flexible customer loads, e.g., hot water systems.

Aside from the first two measures (i.e., limiting CER installations or the power output of CER), the other measures above would incur either additional operational expenditure and/or

⁷⁴ Except at the extremes of voltage (i.e. too high or too low) where the protection systems trip the inverter.

augmentation expenditure for the DNSP. These cost increases would in turn be reflected in the network component of a customer's bill.

B REPORT ON REGULATORY FRAMEWORKS RELATING TO CER TECHNICAL STANDARDS

To support this review, the AEMC engaged Baker McKenzie to prepare a detailed overview of the existing regulatory frameworks in relation to CER technical standards in each state, territory and the Commonwealth, with a particular focus on:

- compliance and enforcement of CER technical standards
- the roles and responsibilities of relevant regulatory bodies
- interactions between the NER and jurisdictional frameworks.

The report is available from the AEMC website and makes clear:⁷⁵

- The implementation of technical standards relating to CER span across state, territory and Commonwealth regulatory frameworks
- Understanding the existing regulatory framework for CER technical standards is challenging due to the differing jurisdictional frameworks and technical regulators and a lack of clarity as to how such frameworks interact. Further, the number of stakeholders involved at different stages of the CER lifecycle influences compliance and the complexity of the existing framework
- Throughout the CER lifecycle, there are stakeholders with various roles and responsibilities that are regulated both under the NER and external to the NER. These include manufacturers, retailers, installers, customers, operators or agents, DNSPs, electrical product suppliers, technology and software providers, industry and end-user bodies, administering government agencies and regulatory authorities.

The report is intended only to provide information into the broader regulatory context for compliance with existing CER technical standards across the various jurisdictions that regulate CER technical standards.

⁷⁵ Baker McKenzie, *Review into CER technical standards: appendix*, 27 April 2023.

C SUMMARY OF OTHER ISSUES RAISED IN SUBMISSIONS

This appendix sets out the issues raised in the first round of consultation on this review process and the AEMC’s response to each issue. If an issue raised in a submission has been discussed in the main body of this document and has not been included in this table.

Table C.1: Summary of other issues raised in submissions

STAKEHOLDER	ISSUE	AEMC RESPONSE
AEC, AEMO, NSW DNSPs and PIAC	Installers should be responsible for compliant installations, with more clear obligations under the NER	This is outside the scope of this review. It could be considered as part of the proposed work on regulatory reform.
AGL, Rheem	Need for technological neutrality to ensure future rules for technical standards should not favour particular technologies or manufacturers	This would be consistent with the AEMC’s general approach. It is also relevant to the proposed work on regulatory reform.
AusNet	Update CSIP-Aus to require data sharing for inverter settings	The ESB is continuing to work on the development of a technical standard or handbook to support interoperability (CSIP-Aus).
SA Power Networks	Ensure EVs are included in any CER compliance framework	The AEMC will continue working with jurisdictions and other energy market bodies on the interaction between EVs and CER technical standards under the NER and other regulatory frameworks.
SwitchDin	Clarify that DNSPs can refuse to connect customers that have employed an installer it suspects does not comply with CER technical standards	This approach would be difficult to implement in practice.
SwitchDin	Define OEMs in the NER	Such a change would be more appropriate to be considered as part of the proposed work on regulatory reform.
TasNetworks	Reform tariffs to allow for targeted recovery of	Cost and benefits can be with particular parties or spread

STAKEHOLDER	ISSUE	AEMC RESPONSE
	compliance costs from non-compliant customers only rather than through shared network costs	across a group and this should be considered in cost recovery issues. Tariff reform is outside the scope of this review. However, it could be considered as part of the proposed work on regulatory reform if considered appropriate by jurisdictions.
Tesla	Interoperability cannot be explored without concurrent work on customer protection frameworks	The ESB is working on the development of a technical standard or handbook to support interoperability. Consumer protections may also be considered as part of the proposed work on regulatory reform.
Tesla	Network developments such as Dynamic Operating Envelopes (DOEs) must be compatible with CER market integration and Virtual Power Plant (VPP) development	These important issues could be included in the proposed work on regulatory reform.

D UPDATED ASSESSMENT FRAMEWORK

Draft recommendations have been developed in accordance with the scope for this review, which requires the Commission to consider:

- compliance with, and enforcement of, CER technical standards in the NER
- the interpretation of standards by NEM participants and others
- interactions between the NER and other regulatory regimes.⁷⁶

In conducting reviews, the Commission must have regard to relevant energy objectives.⁷⁷ As such, the Commission has considered the extent to which draft recommendations would contribute to the achievement of the national electricity objective (NEO):⁷⁸

to promote efficient investment in, and efficient operation and use of, electricity services for the longer term interests of consumers of electricity with respect to -

- (a) price, quality, safety, reliability and security of supply of electricity; and
- (b) the reliability, safety and security of the national electricity system.

The Commission has also considered the extent to which draft recommendations would contribute to the achievement of the national energy retail objective (NERO).⁷⁹ The NERO is:⁸⁰

to promote efficient investment in, and efficient operation and use of, energy services for the long term interests of consumers of energy with respect to price, quality, safety, reliability and security of supply of energy.

Under the NERL, the Commission must also, where relevant, satisfy itself that the rule is:⁸¹

compatible with the development and application of consumer protections for small customers, including (but not limited to) protections relating to hardship customers (the 'consumer protections test').

Where the consumer protections test is relevant in the making of a recommendation, the Commission must be satisfied that both the NERO test and the consumer protections test have been met.⁸² If the Commission is satisfied that one test, but not the other, has been met, the rule cannot be made.

There may be some overlap in the application of the two tests. For example, a rule that provides new protection for small customers may also, but will not necessarily, promote the NERO.

⁷⁶ AEMC, *Review into consumer energy resources technical standards*, consultation paper, 29 September 2022.

⁷⁷ Section 32 of the NEL; section 224 of the NERL.

⁷⁸ Section 7 of the NEL.

⁷⁹ Section 236(1) of the NERL.

⁸⁰ Section 13 of the NERL.

⁸¹ Section 236(2)(b) of the NERL.

⁸² That is, the legal tests set out in s. 236(1) and (2)(b) of the NERL.

For more on how the draft recommendations would promote the NEO and NERO, see below in this appendix.

D.1 Stakeholder feedback on the draft assessment framework

To develop draft recommendations that would promote the NEO and the NERO, the Commission has assessed options against an assessment framework.

Stakeholders were asked to comment on a draft version of the assessment framework in the consultation paper. In general, stakeholders expressed broad support for the draft assessment framework.

- The CEC, SAPN, SwitchDin, PIAC and NSW DNSP's agreed with the outlined criteria in the draft assessment framework.
- PIAC recommended specifying risks to consumer access and affordability from non-compliance under system risks.⁸³
- AGL further suggested separating compliance and enforcement as distinct criteria, with consumer outcomes as a standalone (and overarching) principle.⁸⁴
- NSW DNSPs suggested that enforcing technical standards may have benefits beyond the NEO and NERO and the assessment framework may need to consider these additional benefits.⁸⁵
- Rheem in their submission suggested that the proposed consumer outcomes criteria insufficiently recognises findings of the ESB Customer Insights Collaboration.⁸⁶
- SwitchDin suggested adding criteria relating to impacts of regulation and mandatory application of standards to market competition.⁸⁷

In response to stakeholder feedback, the Commission has updated the assessment framework as follows in the section below. Where certain suggestions by stakeholders have not been directly recognised in the updated assessment framework, this is because the Commission considered the assessment framework sufficiently broad to allow for consideration of these suggestions. In specific response to the suggestion from NSW DNSPs, the Commission reiterates its obligation under the NEL and the NERL to make draft recommendations in accordance with the energy objectives.

D.2 Updated assessment framework

The details of the assessment framework have been updated for this draft report in response to stakeholder comments. The basis of the assessment framework is that set out in the consultation paper:⁸⁸

83 PIAC, submission to the consultation paper, p. 4.

84 AGL, submission to the consultation paper, p. 1.

85 NSW DNSPs, submission to the consultation paper, p. 4.

86 Rheem, submissions to the consultation paper, p. 5.

87 SwitchDin, submission to the consultation paper, p. 2.

88 AEMC, Review into consumer energy resources technical standards, Consultation paper, 29 September 2022, pp. 13-14.

Consumer outcomes

- Will compliance with technical standards to maximise DNSPs' ability to connect optimal CER capacity be promoted?
- Will enforcement approaches impact on how consumers buy and use CER in practice, including interactions with device installers?

Safety, security and reliability

- System risks: What will be the impact of non-compliance on long-term consumer costs from:
 - voltage disturbances
 - procuring ancillary services
 - distribution network constraints
 - remote solar disconnection
 - other grid disruptions.

Implementation considerations

- Cost and complexity:
 - How will the market cost from any regulatory interventions to enforce technical standards compare to alternatives for consumers (device owners and non-device owners)?
 - Have options to address any potential unnecessary over-regulation been considered?
- NEM-wide solutions:
 - What is the extent to which the NEM would benefit from consistent approaches to compliance and enforcement of technical standards?
 - Would CER adoption, and the grid consequences of this, differ across NEM jurisdictions as a result of the recommendations?
 - Will the review account for the jurisdictional limits of the AEMC to introduce obligations under the National Energy Laws?

Principles of good regulatory practice

- Simplicity and transparency:
 - Have the interactions between the NER and jurisdictional frameworks for technical standards been considered?
 - Will any information asymmetries between market participants with respect to technical standards be addressed?
- Principles-based approach:
 - Will a principles-based approach to encourage the greater realisation of CER's potential benefits be beneficial compared with more prescriptive approaches to increase compliance?

Decarbonisation

- Timely transition:
 - Will the review's recommendations consider the contribution of device utilisation to emissions reduction?

E BROADER WORK ON CER INTEGRATION

The AEMC's review into CER technical standards is part of a broader package of projects to better integrate CER devices. These reforms are being undertaken by energy market bodies and the ESB, cooperatively, to realise the opportunities presented by CER for device owners and broader energy consumers alike.

This appendix

provides an update on related projects that are being undertaken across the energy market bodies and ESB concurrent to this review. These are:

- ESB interoperability work stream
- AER Review of the regulatory framework for flexible export limit implementation
- AEMC Review of the regulatory framework for metering services
- ESB Customer Insights Collaboration.

The energy market bodies and the ESB are sharing stakeholder responses to each of these projects. The aim is to better streamline consultation on closely related issues to support the broader objective of CER integration across the NEM.

E.1 ESB interoperability work stream

The ESB has been tasked by Ministers to deliver a 'CER Implementation Plan' as part of the Post-2025 Market Reforms. In its advice to Ministers, the ESB outlined the need to move towards mandates for technical standards for active consumer energy resources and to progress the development of accompanying policies that can ensure these standards meet the changing needs of energy consumers. The interoperability work stream is a key part of this effort.⁸⁹

On 13 October 2022, the ESB published its policy directions paper on interoperability.⁹⁰ The primary purpose of this paper was to seek input from stakeholders on pathways to achieve a nationally consistent implementation of CSIP-Aus that supports positive outcomes for all energy consumers. CSIP-Aus is an adaptation of technical standards developed internationally to support interoperability between CER devices and the power grid. Nationally consistent implementation of CSIP-Aus, according to the ESB, will involve a national certification process for products that support CSIP-Aus. It will also involve a mandate for all new installations to be 'flexible export ready' with a target commencement of July 2024.

As part of its consultation, the ESB sought stakeholder feedback on benefits, costs, and risks of a mandate and potential timeframes. The 'flexible export ready' mandate would not require DNSPs to implement flexible export limits before it is economically efficient for them to do so. The mandate was proposed to relate to new systems and assets only from the date of commencement of the requirements and would not apply to pre-existing systems that households and businesses have already installed. Stakeholder feedback was also sought on

⁸⁹ ESB, *Interoperability policy for consultation*, directions paper, 13 October 2022, p. 6.

⁹⁰ ESB, *Interoperability policy for consultation*, directions paper, 13 October 2022.

what format 'CSIP-Aus' should take and what may be the most appropriate process for 'standardising' its implementation.⁹¹

In its consultations, the ESB acknowledged that CSIP-Aus is a building block within the broader interoperability standards ecosystem. It clarified that the initial step of consulting on the most appropriate 'standardisation' process for CSIP-Aus was not intended to restrict innovation in energy services for consumers. Rather, a 'flexible export ready' mandate for consumer energy resources was being considered by the ESB given the increased opportunity and urgency from interoperability use-cases. These include behind-the-meter interoperability and interoperability with retailers (and other traders and aggregators), that could support product and service innovation and greater customer choice, while also helping protect consumers from technology lock-in.⁹²

For more on the ESB's interoperability work stream, see: <https://esb-post2025-market-design.aemc.gov.au/integration-of-distributed-energy-resources-der-and-flexible-demand>.

E.2 AER Review of the regulatory framework for flexible export limit implementation

The AER's current work stream is to review the appropriateness of the regulatory framework to support DNSPs implementing flexible export limits.⁹³ The review's aim is to have DNSPs consider and address consumer outcomes and experiences when implementing flexible export limits to efficiently utilise the spare capacity available in their networks to manage congestion.

Flexible (as opposed to static) export limits can allow for more electricity to be exported onto the grid by consumers. This provides the opportunity for consumers to achieve greater value from their CER investments such as rooftop solar PV and batteries.

The implementation of flexible export limits allows a DNSP to vary export limits over time and location based on the available capacity of the local network. This enables a DNSP to set the export limit for a given area of their network, allowing CER to operate within the defined limits and assist in managing network congestion.⁹⁴

On 19 October 2022, the AER published an issues paper. The issues paper aimed to identify the gaps in the existing regulatory framework requiring immediate attention to support the efficient implementation of flexible export limits with consumer support. This is the first step in what the AER expects will be an iterative process regarding flexible export limits. The AER has clarified it is not seeking to create incentives for DNSPs to implement flexible export limits sooner than would otherwise be prudent or efficient.⁹⁵

91 ESB, *Interoperability policy for consultation*, directions paper, 13 October 2022, p. 6.

92 ESB, *Interoperability policy for consultation*, directions paper, 13 October 2022, p. 7.

93 AER, *Review of the regulatory framework for flexible export limit implementation*, 19 October 2022.

94 ARENA, *DEIP dynamic operating envelopes working group*, outcomes report, March 2022, p. 5.

95 AER, *Review of the regulatory framework for flexible export limit implementation*, 19 October 2022, p. 14.

For more on the AER's review of the regulatory framework for flexible export limit implementation, see: <https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/review-of-regulatory-framework-for-flexible-export-limit-implementation>.

E.3 AEMC Review of the regulatory framework for metering services

In addition to this review, the AEMC is also conducting its review of the regulatory framework for metering services. The review is working with stakeholders to identify:

- problems with the existing regulatory framework for smart meters in the NEM
- opportunities for improving consumer outcomes through an accelerated deployment of smart meters.

The existing metering framework already provides a pathway for phasing out legacy meters over time, with smart meters installed on a new and replacement basis. This is in addition to some proactive deployments by retailers, and through consumers' own requests. However, it has become clear this approach will not lead to smart meters being deployed fast enough to support the transition to the future energy system.⁹⁶

To accelerate the deployment of smart meters, on 3 November 2022 the AEMC published draft recommendations. Broadly, the draft recommendations were to:⁹⁷

- target universal uptake of smart meters by 2030 in NEM jurisdictions by requiring:
 - DNSPs to progressively retiring legacy accumulation and manually read interval meters
 - retailers to replace the retired meters within a set time frame so a 'critical mass' of customers with smart meters can bring forward the provision of new and innovative services by retailers and third parties, and network benefits that participants will pass through to customers
- enhance existing metering arrangements through rule changes to reduce delays in meter replacements, facilitate coordination between market participants, and empower customers to request a meter upgrade
- support customers through the accelerated deployment by providing:
 - greater transparency about the smart meter deployment
 - information on how customers can access the benefits of smart meters
 - customer safeguards to help manage change
 - greater assurances for customers who might be disadvantaged — including by potentially being assigned immediately to a cost-reflective pricing structure.
- identify greater opportunities for DNSPs, market participants, and customers to access power quality data, which can provide for new value streams from customers' investment in smart meters.

The AEMC is expecting to publish final recommendations in mid-2023.

⁹⁶ AEMC, *Review of the regulatory framework for metering services*, draft report, 3 November 2022, p. i.

⁹⁷ AEMC, *Review of the regulatory framework for metering services*, draft report, 3 November 2022, pp. i-ii.

For more on the AEMC's review of the regulatory framework for metering services, see: <https://www.aemc.gov.au/market-reviews-advice/review-regulatory-framework-metering-services>.

E.4 **ESB Customer insights collaboration**

In developing reforms to integrate CER and flexible demand, customer input is key to testing assumptions and understanding how customers might want to engage with different service providers or products. While the ESB's CER Implementation Plan is not developing energy products or services, feedback from a customer perspective is informing the development of standards to support effective switching and informing where risks or harms may emerge as new services emerge.

The customer insights collaboration is therefore organised around six-month blocks of work (releases) on key customer issues relevant to CER Implementation Plan reform activities, involving active engagement with stakeholders. This is in recognition of the importance of customer input to test assumptions and understand how customers might want to engage with different CER service providers or products. It seeks to obtain feedback from a customer perspective as to how they need or intend to use their customer-owned assets to inform the development of standards to support effective switching and informing where risks or harms may emerge as new services emerge.

The ESB has established a stakeholder steering group (SSG) for each release, with a knowledge sharing report published at the end of each release.

Release one

Release one of the customer insights collaboration took place between February-July 2022 focusing on exploring barriers and enablers to customer reward for flexible CER and energy use.

The insights gathered in release one indicated there are a set of strategic priorities to unlock the great potential of flexibility. These included:

- making flexibility inclusive to unlock opportunities for all consumers
- creating incentives and nudges that make flexibility easy and attractive for consumers
- communicating about flexibility to engage and empower consumers
- earning energy consumers' trust to engage with flexibility products and services.

Release two

Release two of the customer insights collaboration took place between August-December 2022. It built on the work from release one with a deeper dive into the customer insights and critical barriers, to apply them to the reform projects.

Release three

Release three will take place between in the first half of 2023. The SSG will work with the ESB and the teams from the market bodies leading CER Implementation Plan reforms,

building on insights from earlier releases, with a focus on enhancing customers' experience with and value from charging EVs.

For more on the ESB Customer insights collaboration, see: <https://esb-post2025-market-design.aemc.gov.au/customer-insights-collaboration>.

F TERMS OF REFERENCE

This appendix sets out the terms of reference for an AEMC initiated review on CER technical standards.

Context

In the final determination on the governance of CER technical standards, the AEMC identified five distinct roles to support CER technical standards and integration, and realise the benefits of CER:

1. identifying when the NEM needs new CER technical standards
 2. working with the Energy Security Board (ESB) and the Australian Renewable Energy Agency (ARENA)'s Distributed Energy Integration Program (DEIP) to complement existing efforts to identify the NEM's needs from CER technical standards
 3. participating in Standards Australia's CER committees as observing members
 4. updating CER technical standards in the NER, as required
 5. reporting on progress adopting standards and integrating CER.⁹⁸
- The AEMC has also:
 - committed to undertaking each role to the extent it is not already being fulfilled by itself or others
 - noted it could fulfil roles 2, 3, and 4 through its ongoing operations and the rule change process
 - stated that the AEMC may self initiate a review to carry out roles 1 and 5, and may form a committee, working group, or panel of independent experts in support, as needed.⁹⁹
 - Under the NEL, the AEMC may conduct a review of the operation and effectiveness of the NER or any matter relating to the NER. Matters related to CER technical standards under existing NER provisions include:
 - Chapter 10: defining 'CER Technical Standards' in the NER
 - Schedule 5A.1: setting out minimum requirements for complying with CER technical standards in connection agreements between connecting parties and DNSPs, including minimum information requirements for standard agreements provided by DNSPs.

Review objective

- The review's objective is to support CER's successful integration for the long term benefit of electricity consumers. It will do this by assessing the NEM's 'state of play' implementing CER technical standards and identifying necessary next steps for market participants, market bodies, and other relevant parties.
- The AEMC will conduct a review to:

⁹⁸ AEMC, *Governance of distributed energy resources technical standards*, rule determination, 17 March 2022.

⁹⁹ AEMC, *Governance of distributed energy resources technical standards*, rule determination, 17 March 2022.

- identify existing activities in relation to CER technical standards
- clarify the NEM's needs from new CER technical standards
- report on progress on adopting and implementing CER technical standards across the NEM.
- This will allow the AEMC to consider existing work to develop and implement CER technical standards to support the NEM's continued transition. It will do this by identifying potential gaps requiring further action.

It is intended that the 2022-2023 review of CER technical standards will focus on compliance and enforcement of technical standards in the NEM.

In relation to the objectives for the 2022-2023 review, the AEMC will note the existing arrangements in place relating to compliance and enforcement issues of DER technical standards, specifically in relation to AS 4777.2 as referenced in the NER.

In addition, the 2022-2023 review will note the needs and expected outcomes from the successful implementation of CER technical standards, including but not limited to AS4777.2, from the perspective of NEM participants and consumers.

Scope

- In conducting the review, the AEMC will publish a report that:
 - identifies existing activities (and their prioritisation) regarding the introduction of CER technical standards, including the roles and responsibilities of organisations undertaking these activities
 - considers the progress made on implementing CER technical standards
 - identifies, and prioritises, any new work or action required to develop and implement CER technical standards.

These points will be addressed in the report in the context of compliance with the existing DER technical standards in the NER.

It is also anticipated that information obtained about existing standards will be able to inform a generally applicable approach or framework to consider how to achieve improved and workable technical standard compliance across the NEM that balances the needs and objectives of different stakeholders. This would support the development and implementation of future technical standards for CER in the NEM.

- In addition, the AEMC will:
 - engage with industry stakeholders, consumer representatives, relevant jurisdictional bodies, the Energy Security Board, Australian Energy Market Operator and the Australian Energy Regulator.
 - obtain advice as needed from market participants and/or independent consultants through committees, working groups, and reports as relevant.
 - provide a draft report for consultation in March 2023 before publishing a final report no later than 12 months from the date of commencing the review.