AEMC

REVIEW

Australian Energy Market Commission

FINAL REPORT

REVIEW INTO CONSUMER ENERGY RESOURCES TECHNICAL STANDARDS

21 SEPTEMBER 2023

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.

SUMMARY

1 Individual consumers in the national electricity market (NEM) continue to install and connect record amounts of new consumer energy resources (CER) to the power grid. CER covers a range of low or zero emissions devices such as rooftop solar panels, battery energy storage systems, electric vehicles (EVs) and actively controlled appliances such pool pumps. With this transition to a more decentralised power grid, the technical standards for how CER devices interact with the broader power grid is increasingly important for the NEM's security and reliability.

2 In recent years, the Australian Energy Market Commission ('AEMC' or 'the Commission) has made a number of decisions to support the technical integration of CER in the NEM. These decisions:

- introduced CER technical standards in the National Electricity Rules (NER)[1]
- set out an ongoing work plan to support the development and introduction of new CER technical standards.[2]

3 However, monitoring conducted by the Australian Energy Market Operator (AEMO) shows that a large number of recently installed CER devices do not comply with the CER technical standards in the NER. In this final report, the Commission has made recommendations to:

- improve compliance with existing and future CER technical standards, to the maximum extent possible, under existing frameworks
- reform national governance arrangements for standards development and implementation.

4 The recommendations are part of the Commission's *Review into consumer energy resources technical standards*.[3] The review has focused on compliance and enforcement concerns given consensus stakeholder support for prioritising this issue.

5 The recommendations set out the actions needed from jurisdictions, market bodies, and industry to improve consumer outcomes for device owners and electricity consumers more broadly.

Standardised device interactions maximise the benefits from consumer energy resources

6 To date, consumers have mostly installed solar PV on their homes and businesses. However, they are increasingly adding battery energy storage systems (BESS) to the mix of active behind-the-meter devices. In addition, the Commission expects substantial new investment in EVs will increasingly drive two-way and controllable power transfers between individual consumers and the broader power grid.

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1 AEMC, *Technical standards for distributed energy resources*, final rule determination, 25 February 2021.

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

3 The review was self-initiated by the Commission: AEMC, *Review into consumer energy resources technical standards*, consultation paper, 29 September 2022.

7 This new investment in CER is a tremendous opportunity to advance Australia's transition to a decarbonised economy. These zero or low emissions technologies can provide individual device owners with a source of secure and reliable electricity supply. Further, when devices export excess energy to the power grid, non device owners can benefit from the clean and reliable electricity generated and stored by these devices. CER devices can also support system security and reliability.

8 However, the ability of CER to contribute to the broader power grid depends on the extent to which these devices operate consistently and predictably.

9 Technical standards are operational parameters for a device or product and involve common and repeatable rules, guidelines, or characteristics. In the context of CER, an example includes minimum technical standards for inverters. Minimum inverter standards reduce the likelihood of solar PV systems automatically disconnecting from the power grid in response to disturbances on the distribution network.

10 Existing and future technical standards for CER devices are crucial in supporting CER's contribution to the NEM. This is because technical standards provide distribution network service providers (DNSPs) and the Australian Energy Market Operator (AEMO) with more certainty about the operation of CER connected to the power grid. An alternative scenario, in which CER interactions are unpredictable and unreliable, would leave device owners unable to derive the maximum benefit possible from their investment in these zero or low emissions assets and threaten the secure operation of the overall power system.

Standardisation sought by introducing CER technical standards in the National Electricity Rules

11 On 25 February 2021, the Commission made a rule to introduce CER technical standards in the NER.[4] The rule was made in response to a rule change request from AEMO.

12 This rule:

- created CER technical standards for embedded generating (EG) units connecting to a distribution network through a micro EG connection service
- defined CER technical standards as the requirements set out in Australian Standard (AS) 4777.2:2020 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 CER technical standards
- obliged DNSPs to inform connection applicants about the need to comply with CER technical standards, if the connection applicant is proposing to connect a new or replacement embedded generating unit through a basic micro EG connection service

4 Note that the National Electricity Rules refer to 'Distributed Energy Resources'. This reflects a change in terminology by the AEMC since the rule was made, to 'Consumer Energy Resources', in recognition of the central role of consumers in purchasing, connecting, and operating these assets in the NEM.

- included a requirement in the minimum content requirements of connection offers for connection applicants connecting a new or replacement EG unit to comply with the CER technical standards
- applied CER technical standards to new connections or replacement inverters and connection alterations.

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

14 The final rule was intended to address AEMO's concerns about the impact of new CER connections (particularly rooftop PV) on the ability of DNSPs and AEMO to manage voltage disturbances.[5]

However, there has been significant non-compliance with existing standards

15 Despite the crucial importance of technical standards in integrating CER devices, there has been significant non-compliance with existing standards in the NEM. This presents immediate concerns for the operation of the power system which, if not addressed, will be exacerbated as more CER is connected.

16 As set out in AEMO's recent report into non-compliance, in the first quarter of 2022, only 37 per cent of CER devices connected to the NEM were correctly configured to AS4777.2:2020.[6] This aligns with similar findings from the Clean Energy Regulator, in its on-site audits of devices participating in the Small-scale renewable energy scheme (SRES), that 55 per cent of audited inverters with visible settings were incorrectly configured in some way. The Clean Energy Regulator could only confirm that 28 per cent of audited devices were correctly installed in accordance with AS4777.2:2020.[7] The standard, in addition to being required by the NER, is a requirement of participating in the voluntary SRES scheme subsidising customer's installation of behind-the-meter solar PV.[8]

17 Non-compliance with CER technical standards negatively impacts electricity consumers.

18 The main market impact is an increasing threat to power system security. Consequently, the Commission considers this is an urgent problem requiring immediate resolution.[9]

19 CER devices that do not comply with CER technical standards pose a threat to power system security. The key impacts of non-compliance on power supply are due to:[10]

- an increase in the size of credible contingencies as devices may not be able to ride through a disturbance
- an increase in the potential severity of non-credible contingencies related to CER devices

5 AEMC, *Technical standards for distributed energy resources*, final rule determination, 25 February 2021, p. i.
6 AEMO, *Compliance of distributed energy resources with technical settings: a technical report for Australia*, 27 April 2023, p. 38.
7 AEMO, *Compliance of distributed energy resources with technical settings: a technical report for Australia*, 27 April 2023, p. 4.
8 Baker McKenzie, *Review into consumer energy resources technical standards*, 27 April 2023, p. 2.
9 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2022, p. 3.
10 A contingency event is an event that affects the power system in a way which would likely involve the failure or sudden and unexpected removal from operational service of a generating unit or transmission element.

- more limited opportunities for scheduled maintenance of the transmission network as a result of the need to allow for larger contingency sizes in planning.

20 Two further consequences of non-compliance are:

- a reduced ability to connect and export new CER devices, and
- upward pressure on power prices.

21 An independent economic analysis undertaken by consultant Oakley Greenwood in support of this review indicates that non-compliance with existing CER technical standards, if left unaddressed, would lead to significant cumulative costs for NEM consumers.

22 According to Oakley Greenwood, improved compliance would lead to benefits for NEM consumers over the next 15 years of around $500 million.:[11]

23 Oakley Greenwood further noted that it expects increased compliance with CER technical standards would reduce the risk of stability problems on interconnections, increasing the bulk power system.[12] However, as this impact has not been modelled in economic terms, the economic benefits from compliance as estimated above are understated.[13]

The Commission recommends immediate actions to improve compliance

24 In this report, the Commission recommends 10 immediate actions that can be undertaken by industry and market bodies without changes to the National Electricity Law (NEL) or the NER to improve consumer outcomes. These actions are largely consistent with the approach set out in the draft report.[14]

25 The 10 actions cover stakeholders across the life cycle for CER devices — manufacture and supply, installation, and ongoing operations and are summarised below in Table 1.

26 The Commission estimates that if all of the recommended immediate actions 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 NER.[15] In addition, compliance of existing devices is expected to improve by more than 40 per cent.

27 In confirming recommendations for immediate action, the Commission recognises jurisdictions still need to progress regulatory reform. Achieving near universal compliance with CER technical standards for new connections to the distribution network is critical for maintaining the security and reliability of electricity supply for all consumers. The recommendations for immediate action under existing frameworks are unlikely to achieve near universal compliance due to the largely voluntary nature of implementation by industry.

28 Nevertheless, given the importance of compliance with existing and future CER technical

11 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, pp. 3-4.
12 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, p. 11.
13 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, p. 11.
14 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023.
15 AEMO, submission to the consultation paper, p. 4.

standards, the Commission considers it is essential for industry and market bodies to act immediately to improve consumer outcomes. These actions do not require amendments to the NEL or changes to the NER. Rather, the recommendations outlined below should be undertaken voluntarily.

Table 1: 10 recommendations for immediate action across the device life cycle

STAGE	RECOMMENDATION	DESCRIPTION
1. Simplify devices at manufacture and supply	Make 'Region A' the default device setting	OEMs make AS 4777.2:2020 'Region A' (mainland NEM jurisdictions) the default 'top of the list' setting on new CER devices.
	Remove historical device settings	OEMs remove historical versions of NER CER technical standards from the settings menu for the inverter on new CER devices subject to warranty considerations.
	Incorporate new and future CER technical standards in the New Energy Tech Consumer Code (NETCC)	The CEC incorporates existing and any future NER CER technical standards, as they evolve over time, in the requirements for approved sellers voluntarily participating in the NETCC.
2. Promote compliant installation	Mandate CER technical standards training for accreditation under the Small-scale Renewable Energy Scheme (SRES)	NER CER technical standards training be mandatory for accreditation under the SRES. This would be undertaken by entities administering SRES accreditation.
	Fund training on CER technical standards for installers	Jurisdictions to provide funded training on NER CER technical standards for installers.
	Provide guidance on CER technical standards for installers	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

STAGE	RECOMMENDATION	DESCRIPTION
		voluntarily as a form of industry self-regulation.
	Introduce a commissioning process for new CER connections	DNSPs to introduce commissioning processes to verify correct device installation before connecting new CER devices to the grid
3. Support ongoing compliance	Update devices remotely to support compliance	OEMs to voluntarily update devices remotely where possible to remedy non-compliance with NER CER technical standards.
	Make device data available	OEMs to provide data to DNSPs and AEMO to better support monitoring of non-compliance.
	Subsidise re-configuration of non-compliant devices	Jurisdictions to subsidise re-configuration, remote update or re-installation of non-compliant CER devices on behalf of consumers.

Source: AEMC.

However, the immediate actions are not sufficient to address the underlying reason for CER technical standards non-compliance

29 The immediate actions are crucial first steps in improving compliance. However, they are not likely to achieve near-universal compliance due to the largely voluntary nature of implementation by industry.

30 For example, AEMO has reported on its progress in working with original equipment manufacturers (OEMs) on a voluntary basis to increase compliance.[16] In Victoria, where the availability of data from smart meters has supported early remediation efforts, compliance rates for new CER connections have increased to about 70 per cent.[17] Overall, compliance for new connections across the NEM and the Wholesale Electricity Market (WEM) in Western Australia may have already risen to about 40 per cent.[18]

31 The Commission considers there are two main limitations to universal compliance in the existing regulatory framework established under the NEL.

16 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, p. 20.
17 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, p. 20.
18 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, p. 20.

- **An inability to regulate the full range of CER parties on a NEM-wide basis:** Parties across the CER device life cycle are contributing to non-compliance in the NEM. More than half of CER devices are incorrectly installed and AEMO can only work with participating OEMs on a voluntary basis to seek improved CER device performance in the interests of NEM consumers.
- **A lack of sufficient coordination between jurisdictions:** Understanding existing frameworks for CER technical standards is difficult for consumers 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 electricity consumers.

32 Table 2 provides an overview of functional gaps, across the CER device life cycle, that result from these regulatory limitations.

Table 2: **Gaps in the national regulatory framework for CER technical standards**

STAGE	FUNCTION	PARTIES INVOLVED	GAP ANALYSIS
Stage 1: Manufacture and supply compliant CER devices	Design, make, and sell products in accordance with the specifications agreed by consensus through the standards development process.	OEMs	Partial gap. Most OEMs are manufacturing devices in compliance with CER technical standards. But this is largely driven by product listing under the voluntary SRES. Manufacturers are not regulated under the NEL/NER.
	Verify that devices sold in the local market meet the requirements of CER technical standards introduced in the NER.	OEMs	Functional gap. There is no independent verification of devices sold and compliance with NER CER technical standards. Compliant solar PV devices are listed under the SRES (by the CEC) but this will only last the duration of subsidy.
Stage 2: Compliant installation of CER devices	Installers trained to configure devices in accordance with requirements of CER technical standards in the	Installers Consumers DNSPs AER	Functional gap. There is no requirement for installers to be trained on installing or configuring devices to meet CER technical standards. This is despite significant

STAGE	FUNCTION	PARTIES INVOLVED	GAP ANALYSIS
	NER.		benefits for all NEM consumers from correct installation of CER devices.
	Guidance material on compliant installation made publicly available for installers and any other interested party.	OEMs Installers Industry bodies — Clean Energy Council (CEC) and/or the Smart Energy Council (SEC)	Partial gap. There is no provision of guidance material for installers on meeting requirements of CER technical standards in the NER. However, this function may be suited to industry self-regulation through the CEC and/or the SEC.
	Commissioning process verifies device compliance with CER technical standards in the NER before connection to the distribution network.	DNSPs Installers	Partial gap. There is no requirement for DNSPs to establish and operate a commissioning process to ensure connected devices comply with CER technical standards.
Stage 3: Compliant operation of CER devices	Monitor compliance of existing connections at the device level and across distribution networks.	DNSPs OEMs	Partial gap. No explicit requirement for DNSPs to monitor and report on noncompliance. Some DNSPs and OEMs can monitor devices. Indirect obligation on some DNSPs under jurisdictional voltage management requirements.
	Remote update of existing connections, where possible, through software updates to rectify non-compliance with existing CER technical standards in the NER.	OEMs	Functional gap. There is no requirement on OEMs to update or otherwise rectify existing connections to achieve compliance, even where the OEM possesses the technological capability.

Source: AEMC.

33 Market participants such as the DNSPs are limited in their ability to improve compliance. The lack of sufficient information about the manufacture and installation of CER devices across the network means that DNSPs are unable to act alone to drive near universal compliance with CER technical standards.

34 The Commission considers it would be inefficient in the long term to rely only on market participants such as DNSPs to promote compliance with CER technical standards given the OEMs' and installers' ability to remedy compliance concerns earlier in the device supply chain.

35 Further, it would be inappropriate to rely on consumers to improve compliance outcomes. While consumers are actively involved in the device life cycle in purchasing, installing and then owning the asset during its operation, they are limited in their ability to monitor and remedy devices for non-compliance with CER technical standards.

The Commission recommends the development of a national regulatory framework for CER technical standards

36 Reform is needed to develop an enduring NEM-wide regulatory framework for CER technical standards. The immediate actions discussed above will not be able to achieve the desired levels of regulatory compliance without addressing the limitation of the current regulatory framework and the lack of jurisdictional coordination.

37 Throughout this review, stakeholders have consistently called for a coordinated and streamlined approach to standards development and enforcement to reduce the regulatory burden for industry and maximise the range of devices available for local consumers.

38 The Commission agrees with stakeholders and recommends energy ministers lead the development of a national regulatory framework for CER technical standards. This could be considered as part of broader policy work on CER integration, or as a standalone issue, and draw on technical and other advice from the market bodies as needed.

39 The development of a national framework could be progressed through a working group on CER policy established under the National Energy Transformation Partnership (NETP). The working group could be established to exclusively consider CER technical standards. Alternatively, reform could be progressed by a working group considering broader reforms to support the power grid's integration of CER.

40 Regardless of the working group's specific form, the AEMC envisages it would:

- consider the benefits and limitations of several options for a national framework governing the development and implementation of CER technical standards in the NEM (and, potentially, on a national basis). The recommended model would be put to energy ministers for endorsement and implementation.
- be a platform for state and territory governments to consult and coordinate on any policy decisions under jurisdictional frameworks affecting the development and enforcement of CER technical standards.

41 This review has focused on compliance with, and enforcement of, CER technical standards as immediate issues. However, given the close interaction between the development and introduction of technical standards and compliance outcomes, the working group should consider the framework for the full process of developing, introducing and implementing CER technical standards.

Options for addressing gaps in the regulatory framework

42 The Commission has conducted a preliminary assessment of four potential reform options for a national CER technical standards framework to develop, introduce and implement CER technical standards. The options would allow policy makers to direct a full range of CER devices and parties (including OEMs and installers) to undertake actions to promote the efficient integration of CER devices in the interests of all electricity consumers.

Option one: create a new national technical body

43 Under this approach, jurisdictions establish a new national body to oversee the setting of, and compliance with, CER technical standards for the NEM. This approach is, broadly, the preferred option of several industry stakeholders, particularly OEMs.

44 The benefit of this approach would be the ability to create a bespoke new entity focused on CER technical standards.

45 The limitation with this approach would be the high risk of duplicate or fragmented interactions with existing regulatory frameworks. Administrative costs would also likely be higher than expanding the functions of existing agencies.

Option two: expand the role of the AER and the AEMC under the NEL

46 Under this approach, the role of the AER and the AEMC is expanded to allow for the comprehensive setting and enforcement of CER technical standards under the NEL.

47 The benefit of this approach would be the integration of compliance and enforcement with existing work by market bodies on the development and implementation of CER technical standards for the NEM. This approach would also align enforcement activities with the national energy objectives.

48 The limitation of this approach would be the significant resources and expertise required to expand the AER's regulatory focus from its traditional role as economic regulator to technical regulatory issues.

Option three: expand the role of the Clean Energy Regulator under the *Renewable Energy (Electricity) Act 2000* (Cth)

49 Under this approach, the role of the Clean Energy Regulator is expanded to set and ensure compliance with CER technical standards on a nationally consistent basis. This could be done under the *Renewable Energy (Electricity) Act 2000* (Cth).

50 The benefit of this approach would be the ability to leverage the Clean Energy Regulator's existing regulatory relationships with OEMs and installers, neither of which are regulated

under the NEL.

51 The limitation with this approach is the uncertainty over the Clean Energy Regulator's longer-term role in the regulation of small-scale generation units. It is also unclear if the Clean Energy Regulator is sufficiently resourced and experienced to enforce CER technical standards in pursuit of power sector objectives.

Option four: enforce national requirements under jurisdictional frameworks

52 Under this approach, jurisdictions agree that existing and relevant bodies established under local jurisdictional frameworks apply and enforce CER technical standards. Jurisdictions would coordinate to ensure national consistency in the setting and enforcement of standards.

53 The benefit of this approach would be the ability to leverage existing institutions, and a reduced risk of creating duplicate interactions between NEM and local regulatory frameworks.

54 The limitation of this approach would be the significant risk of enforcement gaps and inefficiencies arising due to the differing institutional arrangements in force across jurisdictions. There would also be the risk of unclear accountability for consistent performance against national outcomes, and a potential lack of alignment between the national energy objectives and outcomes under local frameworks.

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1 INTRODUCTION

On 29 September 2022, the Australian Energy Market Commission ('AEMC' or 'the Commission') self-initiated its *Review into consumer energy resources technical standards* ('the review').[19] The review was initiated under section 45 of the National Electricity Law (NEL) and section 232 of the National Energy Retail Law (NERL).[20]

In accordance with its terms of reference, the review focused on:[21]

- compliance with, and enforcement of, consumer energy resources (CER) technical standards in the National Electricity Rules (NER)
- the interpretation of standards by participants in the national electricity market (NEM) and others
- interactions between the NER and other regulatory frameworks.

The focus on compliance and enforcement concerns followed consensus stakeholder support for prioritising the issue within the AEMC's broader work plan for CER technical standards.[22] Stakeholders broadly agree that the level of compliance is unsatisfactory and has the potential to lead to power system security issues or require costly action to augment networks to deal with uncertain responses from non-compliant CER devices. The AEMC's broader work plan consists of five distinct roles:[23]

- **Role one**: identify when new CER technical standards are needed
- **Role two**: actively work with the Energy Advisory Panel (EAP) and the Australian Renewable Energy Agency (ARENA)'s Distributed Energy Integration Program (DEIP) to support existing work on CER technical standards
- **Role three**: observe Standards Australia's CER committees to contribute to the established work program
- **Role four**: update CER technical standards in the NER by assessing any rule change requests to add, update or amend technical standards in the NER, as required
- **Role five**: report on progress adopting technical standards in the NER (this review).

Each role is part of broader efforts to fully realise the consumer benefits from the NEM's technical integration of CER. The Commission has committed to making sure all five essential roles for CER technical standards are being fulfilled efficiently by complementing jurisdictions, other energy market bodies and broader industry initiatives.[24]

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

20 Part 4 of the NEL and Part 9 of the NERL set out the functions and powers of the AEMC. Under Division 5 of Part 4 of the NEL and Division 5 of Part 9 of the NERL, the AEMC has the power to conduct a review into the operation and effectiveness of the National Electricity Rules (NER) and National Energy Retail Rules (NERR), respectively.

21 AEMC, *Review into consumer energy resources technical standards*, consultation paper, 29 September 2022, pp. 28-29.

22 AEMC, *Review into consumer energy resources technical standards*, consultation paper, 29 September 2022, p. 1.

23 AEMC, *Review into consumer energy resources technical standards*, consultation paper, 29 September 2022, p. 1.

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

The review is intended to support the implementation of existing CER technical standards, and any future CER technical standards that might be required for the NEM.[25]

25 AEMC, *Review into consumer energy resources technical standards*, consultation paper, p. 2.

2 PROBLEM OF NON-COMPLIANCE

Consumers continue to install and connect record amounts of new CER to the power grid. CER are behind-the-meter resources such as rooftop solar panels, battery energy storage systems, electric vehicles (EVs) and actively controlled appliances such as pool pumps. These resources are typically zero or low emissions, driving decarbonisation and the NEM's increased reliance on two-way power transfers.

Technical standards are one of the key enablers to the NEM's ability to integrate significant new CER capacity. However, as explained in this chapter, there is significant non-compliance with CER technical standards in the NER. The high level of non-compliance means that key power system security requirements such as voltage disturbance ride through for rooftop solar systems are not implemented. The scale of non-compliance of current standards also casts doubt on the NEM's ability to implement future CER technical standards unless changes are made.

Non-compliance affects all electricity consumers, whether they own CER devices or not. The underlying reason for non-compliance is limitations in the scope and coverage of the regulatory framework for developing, introducing, and implementing CER technical standards for the NEM.

2.1 Technical standards are essential to integrate CER in the NEM

Technical standards are established requirements for a device or product. Standards involve common and repeatable rules, guidelines, or characteristics.

In the context of CER, an example includes minimum technical standards for inverters. Minimum inverter standards reduce the likelihood of solar PV systems automatically disconnecting from the power grid in response to disturbances on the distribution network. These requirements were introduced in the NER to address the Australian Energy Market Operator (AEMO)'s concerns about the impact of new CER connections (particularly rooftop PV) on the ability of Distribution Network Service Providers (DNSPs) and AEMO to manage voltage disturbances.[26]

For more on CER technical standards in the NER, see Box 1.

BOX 1: CER TECHNICAL STANDARDS IN THE NATIONAL ELECTRICITY RULES

On 25 February 2021, the Commission made a rule to introduce CER technical standards in the NER.4 The rule was made in response to a rule change request from AEMO.

The rule:

26 AEMC, Technical standards for distributed energy resources, final rule determination, 25 February 2021, p. i.

- created CER technical standards for embedded generating (EG) units connecting to a distribution network through a micro EG connection service
- defined CER technical standards as the requirements set out in Australian Standard (AS)4777.2:2020 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 CER technical standards
- obliged DNSPs to inform connection applicants about the need to comply with CER technical standards, if the connection applicant is proposing to connect a new or replacement embedded generating unit through a basic micro EG connection service
- included a requirement in the minimum content requirements of connection offers for connection applicants connecting a new or replacement EG unit to comply with the CER technical standards applied CER 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.

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

Note: The NER refers to 'distributed energy resources'. This reflects a change in terminology by the AEMC since the rule was made to 'consumer energy resources', in recognition of the central role of consumers in purchasing, connecting, and operating behind-the-meter assets in the NEM.

Existing and future technical standards for CER devices will be crucial in supporting CER's contribution to the NEM. This is because technical standards provide distribution network service providers (DNSPs) and the Australian Energy Market Operator (AEMO) with more certainty about the operation of CER connected to the power grid. An alternative scenario, in which CER devices interactions with the power grid are unpredictable and unreliable, would leave device owners unable to derive the maximum benefit possible from their investment in these zero or low emissions assets and threaten the secure operation of the overall power system.

2.2 But there is significant non-compliance with existing standards

Despite the crucial importance of technical standards in technically integrating CER devices, there has been significant non-compliance with existing standards in the NEM. This presents immediate concerns and undermines confidence in the effective implementation of any future CER technical standards.

As set out in AEMO's recent report into non-compliance, in the first quarter of 2022, only 37 per cent of newly connected CER devices in the NEM were correctly configured to AS4777.2:2020 — the only technical standard on CER devices in the NER.[27] This aligns with similar findings from the Clean Energy Regulator, in its on-site audits of devices participating in the Small-Scale Renewable Energy Scheme (SRES), that 55 per cent of audited inverters with visible settings were incorrectly configured in some way. The Clean Energy Regulator

27 AEMO, *Compliance of distributed energy resources with technical settings: a technical report for Australia*, 27 April 2023, p. 38.

could only confirm that 28 per cent of audited devices were correctly installed in accordance with AS4777.2:2020.[28] The standard, in addition to being required by the NER, is a requirement of participating in the voluntary SRES scheme subsidising customer's installation of behind-the-meter solar PV.[29]

2.3 Non-compliance is a problem for all NEM consumers

The main market impact of non-compliance with CER technical standards is an increasing threat to power system security. Consequently, the Commission considers this is an urgent problem requiring immediate resolution.[30]

Security and reliability impacts for the bulk transmission system resulting from non-compliance of CER devices is due to:[31]

- an increase in the size of credible contingencies as devices may not be able to ride through a disturbance
- an increase in the potential severity of non-credible contingencies related to CER devices
- more limited opportunities for scheduled maintenance of the transmission network as a result of the need to allow for larger contingency sizes in planning.

A contingency event is an event that affects the power system in a way which would likely involve the failure or sudden and unexpected removal from operational service of a generating unit or transmission element.

There are two further consequences of non-compliance for NEM consumers.[32]

- **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
  - the reduced ability of the DNSP to 'host' new CER connections. This results from higher network constraints when existing CER connections are non-compliant with technical standards and unable to ride through voltage disturbances.
- **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.

For more, see the technical assessment of non-compliance in the draft report.[33]

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28 AEMO, Compliance of distributed energy resources with technical settings: a technical report for Australia, 27 April 2023, p. 4.
29 Baker McKenzie, *Review into consumer energy resources technical standards*, 27 April 2023, p. 2.
30 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2022, p. 3.
31 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2022, p. 46.
32 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2022, pp. 49-52.
33 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2022, pp. 46-52.

2.3.1 Economic assessment of non-compliance

To further estimate the market impact of non-compliance, the AEMC engaged Oakley Greenwood to estimate the economic cost of non-compliance for NEM consumers.

The economic assessment found that increased compliance with existing CER technical standards would deliver significant benefits for NEM consumers.[34]

According to Oakley Greenwood, there would be three main benefits from addressing non-compliance.[35]

- There is increased stability of behind-the-meter solar PV during fault conditions. This:
  - reduces the need for contingency services within each NEM region
  - allows for greater power flows between NEM regions as regional stability constraints are impacted to a lesser degree than would be the case with less compliance.
- Increased voltage and reactive power support in the distribution network allows for increased CER hosting capacity and fewer restrictions on power exports from behind-the-meter solar PV.
- Further network level benefits from compliance with CER technical standards are related to the quality of power supply in the NEM.

This means that addressing non-compliance would lead to cumulative benefits for NEM consumers over the next 15 years of:[36]

- more than $500 million in avoided frequency control ancillary services (FCAS) costs
- about $7.2 million due to the increased ability of rooftop PV to export power.

Oakley Greenwood further noted that it expects increased compliance with CER technical standards would reduce the risk of stability problems on interconnections.[37] However, as this impact has not been modelled in economic terms, the economic benefits from compliance as estimated above are understated.[38]

As Oakley Greenwood notes in its economic assessment, there has been an improvement in compliance rates since the Commission commenced this review in September 2022.[39]

For example, AEMO has experienced only partial progress in its voluntary efforts with original equipment manufacturers (OEMs) to increase compliance.[40] In Victoria, where the availability of data from smart meters has supported early remediation efforts, compliance rates for new CER connections have increased to about 70 per cent.[41] Overall, compliance for new connections across the NEM and the Wholesale Electricity Market (WEM) in Western Australia may have already risen to about 40 per cent.[42]

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34 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, p. 1.
35 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, p. 1.
36 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, pp. 3-4.
37 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, p. 11.
38 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, p. 11.
39 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, p. 20.
40 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, p. 20.
41 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, p. 20.
42 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, p. 20.

Overall progress on compliance is attributed to a combination of:[43]

- general market attention to the issue of non-compliance with CER technical standards
- AEMO reporting on the size and likely market impact of non-compliance
- this review's consideration of the issue and draft recommendations setting out roles and responsibilities to improve compliance across the device life cycle.

For more on Oakley Greenwood's assessment, see the separately published appendix to this final report.[44]

2.4 Limitations in the regulatory framework is the underlying reason for non-compliance

Through this review, the Commission has identified that the underlying reason for non-compliance is the limitation in the regulatory framework. These limitations are:

- the inability to directly regulate, under the NEL, all parties that are, in practice, determining CER device outcomes
- a lack of sufficient coordination between jurisdictions when setting standards and establishing compliance and enforcement under jurisdictional frameworks..

2.4.1 Inability to regulate the full range of CER parties

Parties across the CER device life cycle are contributing to non-compliance in the NEM. More than half of CER devices are incorrectly installed and AEMO can only work with participating OEMs on a voluntary basis to seek improved CER device performance in the interests of NEM consumers.

For example, according to AEMO, its data consistently indicates that more than half of CER devices in the NEM are incorrectly installed, with a common mistake being the incorrect selection of the earlier 2015 version of the technical standard from the inverter's settings menu.[45]

However, AEMO's analysis also indicates that OEMs have considerable influence over the compliance of their products in the field.[46] This is because of the ability of several OEMs to remotely view and update settings for devices already connected to the power grid. OEMs can also update the settings menus for devices to make it easier for installers to select the correct version of technical standards. Such actions by OEMs could help achieve near universal compliance with CER technical standards.

Currently, AEMO is only able to work with participating OEMs on a voluntary basis to seek improved CER device performance in the interests of NEM consumers as there is no provision under the regulatory framework that requires OEMs to take actions to meet CER technical

43 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023, p. 20.
44 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023.
45 AEMO, *Compliance of distributed energy resources with technical settings: a technical report for Australia*, 27 April 2023, pp. 5-6.
46 AEMO, *Compliance of distributed energy resources with technical settings: a technical report for Australia*, 27 April 2023, p. 5

standards. There is also no regulatory requirement on installers to ensure devices are installed in accordance with CER technical standards.

Market participants such as the DNSPs are also limited in their ability to improve compliance.The lack of sufficient information about the manufacture and installation of CER devices across the network means that DNSPs are unable to act alone to drive near universal compliance with CER technical standards.

The Commission considers it would be inefficient in the long term to rely only on market participants such as DNSPs to promote compliance with CER technical standards given the OEMs' and installers' ability to remedy compliance concerns earlier in the device supply chain.

Further, it would be inappropriate to rely on consumers to improve compliance outcomes. While consumers are actively involved in the device life cycle in purchasing, installing and then owning the asset during its operation, they are limited in their ability to monitor and remedy devices for non-compliance with CER technical standards.

Table 2.1 provides an overview of the gaps in the existing regulatory framework for setting and enforcing nationally consistent CER technical standards.

Table 2.1: **Gaps in the national regulatory framework for CER technical standards**

STAGE	FUNCTION	PARTIES INVOLVED	GAP ANALYSIS
Stage 1: Manufacture and supply compliant CER devices	Design, make, and sell products in accordance with the specifications agreed by consensus through the standards development process.	OEMs	Partial gap. Most OEMs are manufacturing devices in compliance with CER technical standards. But this is largely driven by product listing under the voluntary SRES. Manufacturers are not required to comply under the NEL/NER as they are not subject to those instruments.
	Verify that devices sold in the local market meet the requirements of CER technical standards introduced in the NER.	OEMs	Functional gap. There is no independent verification of devices sold and compliance with NER CER technical standards. Compliant solar PV devices are listed under the SRES (by the CEC) but this will only last the duration of the subsidy.
Stage 2:	Installers trained to	Installers	Functional gap. There is no

STAGE	FUNCTION	PARTIES INVOLVED	GAP ANALYSIS
Compliant installation of CER devices	configure devices in accordance with requirements of CER technical standards in the NER.	Consumers DNSPs AER	requirement for installers to be trained on installing or configuring devices to meet CER technical standards.
	Guidance material on compliant installation made publicly available for installers and any other interested party	OEMs Installers Industry bodies — CEC and/or the SEC	Partial gap. There is no provision of guidance material for installers on meeting requirements of CER technical standards in the NER.
	Commissioning process verifies device compliance with CER technical standards in the NER before connection to the distribution network.	DNSPs Installers	Partial gap. There is no requirement for DNSPs to establish and operate a commissioning process to ensure connected devices comply with CER technical standards.
Stage 3: Compliant operation of CER devices	Monitor compliance of existing connections at the device level and across distribution networks.	DNSPs OEMs	Partial gap. No explicit requirement for DNSPs to monitor and report on non-compliance. Some DNSPs and OEMs can monitor devices. Indirect obligation on some DNSPs under jurisdictional voltage management requirements.
	Remote update of existing connections, where possible, through software updates to rectify noncompliance with existing CER technical standards in the NER.	OEMs	Functional gap. There is no requirement on OEMs to update or otherwise rectify existing connections to promote compliance, even where the OEM possesses the technological capability.

STAGE	FUNCTION	PARTIES INVOLVED	GAP ANALYSIS
	Clear, transparent, and efficient process for contacting, where necessary, consumers owning any non-compliant devices.	DNSPs Consumers	Partial gap. DNSPs are increasingly contacting consumers with noncompliance connections. But there is no direct requirement for this communication.

Source: AEMC.

2.4.2 Lack of sufficient coordination between jurisdictions

Understanding existing frameworks for CER technical standards is difficult for consumers 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 electricity consumers.

This fragmentation is compounded by a lack of coordination between jurisdictions when making decisions, under local frameworks, that may affect compliance with CER technical standards in the NER. This issue is highlighted by examples of the interactions between the NER and jurisdictional frameworks below:

- AS4777.2:2020 is a direct requirement under three jurisdictional frameworks: the Commonwealth's voluntary SRES, and under state regulations for South Australia and Tasmania.
- AS4777.2:2020 is indirectly required in each state and territory due to the standard being referenced in the wiring rules (AS3000:2018), which set the safety requirements for behind-the-meter electrical installations.[47] The regulation of electrical safety is the responsibility of state and territory governments, rather than market bodies under the NEL.
- Individual jurisdictions (South Australia, Queensland and Victoria) have implemented, or are contemplating, local regulations governing the contribution of CER to the management of minimum demand periods in the grid. While this issue is not directly related to the development and implementation of CER technical standards, one of the main ways in which minimum demand can be managed is through dynamic operating envelopes (DOEs). DOEs can be achieved through technical standardisation, and allow consumers to scale power exports up (or down) depending on prevailing conditions on the distribution network. Local decisions on minimum demand management therefore

47 Part 1 of AS3000.2018 provides for minimum regulatory requirements for a safe electrical installation. Part 2 provides work methods and installation practices that are deemed to comply with the requirements of Part 1.

have the potential to see the introduction of various approaches to future CER technical standards for the NEM.[48]

The interactions between jurisdictional frameworks and the NER also do not provide a framework that is able to regulate the full range of CER parties and devices, on a NEM-wide basis. There is no mechanism for jurisdictions to consult on, and potentially coordinate, local decision-making on CER technical standards. This is a concern for industry, particularly OEMs, given Australia largely imports CER devices. Decisions under local frameworks, impacting the development and implementation of CER technical standards, may be sufficiently different as to create slightly different compliance regimes from state to state. This would require additional efforts by OEMs to comply with each framework, in return for accessing only a relatively small share of the overall Australian market.

By contrast, greater unanimity in the regulation of CER technical standards streamlines the compliance obligations of OEMs seeking to sell CER devices in the Australian market.

For more on the interactions between local regulatory frameworks and the NER, see Box 2.

BOX 2: OVERVIEW OF RELEVANT REGULATORY FRAMEWORKS

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 makes clear:

- 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 life cycle influences compliance and the complexity of the existing framework
- Throughout the CER life cycle, there are stakeholders with various roles and responsibilities that are regulated both under the NER and external to the NER. These consist of 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

48 For more on dynamic operating envelopes in the NEM, see AER, *Review of regulatory framework for flexible export limit implementation: final response and proposed actions*, 31 July 2023.

compliance with existing CER technical standards across the various jurisdictions that regulate CER technical standards.

For more, see the Baker McKenzie report as published with the draft report of this review.

Source: Baker McKenzie, *Review into consumer energy resources technical standards*, 27 April 2023.

2.5 Effective reform requires action by jurisdictions

The AEMC, along with other market bodies, has largely exhausted its ability to address these regulatory limitations. This is because the reasons for non-compliance largely sit outside the frameworks established within the NEL.

The AEMC may make rules across a broad range of CER devices under the NEL: solar PV, battery energy storage systems, electric vehicles, and others, with the AER enforcing the obligations on the relevant persons. However, the NEL limits rule-making to certain types of persons. In practice, for CER, this means rule-making is limited to DNSPs and customer owned devices (for example, embedded generation).

3 OVERVIEW OF RECOMMENDATIONS

Compliance with CER technical standards must be improved to achieve the full potential benefits of CER. In the short term, this review recommends immediate actions aimed at improving compliance over the life cycle of devices. However, the Commission recognises that regulatory constraints limit the level of compliance that can be achieved under the existing framework. Longer term governance reform is required to achieve consistent and enduring compliance with CER technical standards.

This chapter provides an overview of recommendations to improve compliance with existing and any future CER technical standards for the NEM. It discusses changes between the draft and final recommendations, and summarises how the recommendations promote the national energy objectives.

3.1 Dual approach to improving compliance

3.1.1 Recommendation 1: Jurisdictions to progress regulatory reform

The Commission's first recommendation is for energy ministers to lead the development of a national regulatory framework for CER technical standards. This could be considered as part of broader CER integration, or as a standalone issue, and draw on technical and other advice from the market bodies as needed.

The development of a national framework could be progressed through a working group on CER policy established under the National Energy Transformation Partnership (NETP). The working group could be established to exclusively consider CER technical standards. Alternatively, reform could be progressed by a working group considering broader reforms to support the power grid's integration of CER.

Regardless of the working group's specific form, the AEMC envisages it would:

- consider the benefits and limitations of several options for a national framework governing the development and implementation of CER technical standards in the NEM (and, potentially, on a national basis). The recommended model would be put to energy ministers for endorsement and implementation.
- be a platform for state and territory governments to consult and coordinate on any policy decisions under jurisdictional frameworks affecting the development and enforcement of CER technical standards.

This review has focused on compliance with, and enforcement of, CER technical standards as immediate issues. However, given the close interaction between the development and introduction of technical standards and compliance outcomes, the working group should consider the framework for the full process of developing, introducing and implementing CER technical standards.

For more on the reform recommendation, including the benefits and limitations of each option, see chapter 4.

3.1.2 Recommendations 2–11: Stakeholders to act immediately under the existing framework

The Commission also recommends 10 immediate actions to improve compliance of CER technical standards and improve consumer outcomes. These actions do not require NEL or rule changes and can be undertaken now by industry, jurisdictions and market bodies.

The 10 actions cover stakeholders across the life cycle for CER devices — manufacture and supply, installation, and ongoing operations.

- Stage one: simplify device settings at manufacture and supply
  - Make 'Region A' the default device setting
  - Remove historical device settings
  - Incorporate new and future CER technical standards in the New Energy Tech Consumer Code (NETCC)
- Stage two: promote compliant installation
  - Mandate CER technical standards training for accreditation under the Small-scale renewable energy scheme (SRES)
  - Fund training on CER technical standards for installers
  - Provide guidance on CER technical standards for installers
  - Introduce a commissioning process for new CER connections
- Stage three: support ongoing compliance
  - Update devices remotely to support compliance
  - Make device data available
  - Subsidise re-configuration of non-compliant devices.

The above actions have been developed to address compliance issues for current CER technical standards identified through this review. The Commission urges stakeholders to implement them urgently and in parallel with the development of an enduring national regulatory framework.

For more on the recommendations for immediate action under the existing framework, see chapter 5.

3.2 Final recommendations are largely consistent with the draft recommendations

The review's final recommendations are largely consistent with the draft recommendations.[49]

The Commission has maintained its dual approach of recommending immediate action under the existing regulatory framework, while also calling on jurisdictions to progress regulatory reform. The immediate actions recommended under the existing regulatory framework maintains its focus on improvements to consumer outcomes across the life cycle for CER devices.

49 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023.

In response to stakeholder feedback on the draft report, the final report outlines potential options for the development of a national framework and urges energy ministers to prioritise the commencement of work on regulatory reform.

The main change in the final report is the removal of two draft recommendations for immediate action under the existing regulatory framework.

- The final report does not include a recommendation to accelerate the rollout of smart meters.
  - The draft recommendation was to support an accelerated deployment of smart meters to enable improved compliance with CER technical standards.[50] It considered smart meters 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.[51]
  - In the final report, the Commission continues to identify the key role that smart meters can play in identifying non-compliance with CER technical standards. However, the recommendations in support of the rollout of smart meters are now exclusively made in the final report of the review of the regulatory framework for metering services and are not repeated in this report.[52]
- Nor does the final report recommend that DNSPs define the process for contacting consumers.
  - The draft recommendation was for DNSPs to develop and follow a defined process for contacting customers whose devices may not be compliant with CER technical standards and to explain options for returning to compliance.
  - However, DNSPs were concerned that:[53]
    - the draft recommendation could create a new expectation that DNSPs are the 'first point of call' for a consumer regarding a non-compliant installation.[54]
    - network service providers have limited practical options for contacting individual customers
    - the draft recommendation was unlikely to make a material difference in improving compliance with CER technical standards.
  - The Commission still considers that any interactions between DNSPs and consumers should be undertaken transparently and efficiently. Nevertheless, in recognition of DNSP concerns about the draft recommendation and to avoid creating the expectation of a new customer facing role for DNSPs, it has not maintained the recommendation in the final report.

There are several further minor changes to the draft recommendations.

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50 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 33.
51 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 33.
52 AEMC, *Review of the regulatory framework for metering services*, final report, 30 August 2023.
53 Submissions to the draft report: SA Power Networks, p. 3; Citipower, Powercor and United Energy, p. 3; Ergon and Energex, p. 2.
54 SA Power Networks, submission to the draft report, p. 3.

- Allowance is made for the need of some OEMs, in limited circumstances, to maintain historical versions of CER technical standards where devices are sold into jurisdictions in the Pacific and New Zealand. This reflects warranty obligations and the reliance on historical versions of AS4777.2 in these markets.
- The incorporation of existing and future CER technical standards in the NETCC is now described as an action during the manufacture and supply of CER devices. This reflects the intent of the Code to address its activities to participants in this earlier stage of the CER device life cycle. Additional flexibility has also been introduced for the Clean Energy Council (CEC), as the Code's administrator, to efficiently introduce new requirements as the Code evolves in line with market and technological developments.
- The funding of training for installers on CER technical standards in the NER is now recommended for jurisdictions specifically, rather than a combination of DNSPs and jurisdictions. This reflects the need for immediate action to improve compliance as regulatory reform progresses. Relying on action by DNSPs, by contrast, would have depended on periodic revenue determinations for DNSPs. The staggered nature of these determinations for DNSPs across the NEM would have led to the risk of delayed implementation across much of the NEM.
- The Commission has clarified that the commissioning process for new CER connections, to verify compliance with CER technical standards before devices are connected to the distribution network, can be a digital process — that is, there is no requirement for the process to rely on physical paperwork.
- For similar considerations as for the updated recommendation for funded installer training, the final recommendations clarify that any subsidisation of device re-configuration should be funded by jurisdictions. This recommendation further clarifies that any subsidisation should only occur for devices installed before a certain date. This is intended to mitigate the risk of unintentionally creating new incentives for non-compliance of future connections.

For more on the reasons for these modest changes to recommendations for immediate action, see chapter 5.

3.3 Recommendations promote the national energy objectives

The final recommendations advance the national electricity objective (NEO) and the national energy retail objective (NERO) in five main ways.

- *Improving consumer outcomes.* Consumer outcomes for device owners and consumers more broadly should improve because:
  - device owners will be provided with increased support for the sale and installation of compliant CER devices through interventions across the device life cycle.
  - electricity consumers (including those that do not own CER) benefit from reduced costs of higher network expenditure and expenditure in wholesale energy and ancillary service markets for high levels of CER technical standards compliance.

    - consumer outcomes will be improved through recommendations that are compatible with the way most consumers engage with CER devices across the device life cycle.
- *Maintaining safe, secure, and reliable power supply*. The recommendations 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 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 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 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 recommendations should support decarbonisation objectives of jurisdictions and the energy sector by allowing for increased reliance on zero or low 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 contribution of individual recommendations to the national energy objectives, see chapter 4 and chapter 5. Appendix C provides an overview of the assessment framework for this review.

4 RECOMMENDATION FOR REGULATORY REFORM

BOX 3: RECOMMENDATION TO PROGRESS REGULATORY REFORM

Recommendation 1: Jurisdictions to progress regulatory reform through a working group to develop an enduring national regulatory framework for CER technical standards. Reporting to energy and climate ministers, the working group could consist of officials from the Commonwealth and each state and territory government. The working group's consideration should initially focus on four main reform options identified through the review. The market bodies should continue to advise officials on the market benefits from improving compliance and options for regulatory reform.

4.1 Jurisdictions to progress national regulatory reform

Reform is needed to develop an enduring NEM-wide regulatory framework for CER technical standards. While we have made immediate recommendations to increase the level of compliance within existing regulatory constraints, those recommendations will not achieve the levels of compliance necessary to ensure the secure operation of the power system.[55]

Throughout this review, stakeholders have consistently called for a coordinated and streamlined approach to standards development and enforcement to reduce the regulatory burden for industry and maximise the range of devices available for local consumers. The Commission agrees with stakeholders who recommend energy ministers lead the development of a national regulatory framework for CER technical standards. This could be considered as part of broader CER integration work program, or as a standalone issue, and draw on technical and other advice from the market bodies as needed.

The development of a national framework could be progressed through a working group CER policy established under the National Energy Transformation Partnership (NETP). The working group could be established to exclusively consider CER technical standards. Alternatively, reform could be progressed by a working group considering broader reforms to support the power grid's integration of CER.

Regardless of the working group's specific form, the AEMC envisages it would:

- consider the benefits and limitations of several options for a national framework governing the development and implementation of CER technical standards in the NEM (and, potentially, on a national basis). The recommended model would be put to energy ministers for endorsement and implementation.
- be a platform for state and territory governments to consult and coordinate on any policy decisions under jurisdictional frameworks affecting the development and enforcement of CER technical standards.

55 AEMO submission to the draft report, p. 2.

This review has focused on compliance with, and enforcement of, CER technical standards as immediate issues. However, given the close interaction between the development and introduction of technical standards and compliance outcomes, the working group should consider the framework for the full process of developing, introducing and implementing CER technical standards.

4.1.1 Objectives of reform

Three main objectives should inform the development of a new national framework for setting and enforcing CER technical standards.

- **Maximum compatibility with consumer needs and behaviour.** Reform should lead to a regulatory framework that is able to accommodate the strong and continued interest of consumers to install and connect new CER to the power grid. This means, for example, the framework should be able to support effective enforcement of voltage ride through requirements to increase the hosting capacity of distribution networks. In assigning compliance responsibilities the framework should recognise the limited ability of most device owners to engage directly with technical regulatory requirements.
- **Ensure that devices meet essential requirements.** Provide a clear and transparent framework where the obligations and responsibilities for assessing compliance and taking corrective action are clear. This is key to ensuring that:
  - key power system needs are maintained without unintended consequences
  - the benefits from CER devices are realised for device owners and other electricity consumers.
- **Minimal implementation costs.** The new framework should support economically beneficial outcomes for all electricity consumers from the power grid's integration of CER. This means the framework should support the introduction and enforcement of CER technical standards that provide net benefits for electricity consumers, accounting for any administrative costs associated with introducing a new regulatory framework.

These objectives are consistent with the overall assessment framework for this review.[56]

4.2 Four reform options for jurisdictions to consider

The Commission has conducted a preliminary assessment of four potential reform options for a national CER technical standards framework to develop, introduce and implement CER technical standards. The options would allow policy makers to direct a full range of CER devices and parties (including OEMs and installers) to undertake actions to promote the efficient integration of CER devices in the interests of all electricity consumers. These options are not mutually exclusive and it is important for jurisdictions to further assess the options to determine which is the most appropriate.

56 For more, see section 3.3 and appendix C.

4.2.1 Option one: create a new national technical body

Under this approach, jurisdictions establish a new national body to oversee the setting of, and compliance with, CER technical standards for the NEM. Under this approach, a single national body would be responsible for developing, setting, and enforcing CER technical standards.

This approach is, broadly, the preferred option of several industry stakeholders, particularly OEMs.

The benefit of this approach would be the ability to create a new entity focused exclusively on CER technical standards. It would provide industry with a 'one stop shop' for making sure CER devices sold and installed in Australia are contributing to the efficient integration of behind-the-meter technologies in the NEM and other power grids. This singular regulatory focus would be likely to increase the accountability of regulatory decision-making and provide for simpler governance.

However, this approach increases the risk of duplicate or fragmented interactions between regulatory frameworks. This is due to the significant work to date by market bodies to set and enforce CER technical standards, in consideration of the impact of CER on all electricity consumers.

Establishing a new national technical body would be likely to take significant time. This may not be timely enough given the pace at which consumers are connecting new CER to the power grid.

There would need to be a clear and reliable source of ongoing funding to support the enduring operation of a new body. Further, the administrative costs associated with this option are likely to be higher than other options considered in this review.

Further consideration would need to be given to the potential benefit in separating the setting and enforcement of CER technical standards. A single body responsible for both setting and enforcing standards may give rise to conflicting institutional interests.

4.2.2 Option two: expand the role of the AER and the AEMC under the NEL

Under this approach, the role of the AER and the AEMC is expanded to allow for the comprehensive setting and enforcement of CER technical standards under the NEL.

The benefit of this approach would be the integration of compliance and enforcement with existing work by market bodies on the development and implementation of CER technical standards for the NEM. For example, in recent years, market bodies have collectively:

- identified NEM priorities from new and updated technical standards for the NEM
- participated in the development of an updated version of AS4777.2 to support voltage ride through by grid-connected CER
- supported work by the ESB to develop an Australian approach to CER device interoperability, through the development of CSIP-Aus
- identified the system impact of non-compliance with CER technical standards

- developed regulatory guidelines for the implementation of flexible export limits for CER devices through technical standardisation.

Establishing a more comprehensive basis for continuing work on CER technical standards under the NEL would confirm CER integration as a core function of market bodies in the energy transition. It would complement efforts to consult with a broader range of CER stakeholders to better understand parties determining power system outcomes.

A disadvantage would be the significant resources and expertise required to expand the focus of market bodies from traditional functions focused on the interconnected power system and distribution networks.

Expanding the functions of market bodies to set and enforce CER technical standards would require expanding the:

- AER's regulatory focus from its traditional role as economic regulator to a broader remit that also includes technical regulatory issues, and
- range of stakeholders affected by and consulted about market body decision-making.

The approach would require careful consideration by jurisdictions, in amending the NEL, to clearly define how market bodies would interact with industry and jurisdictions in undertaking the additional roles.

4.2.3 Option three: expand the role of the Clean Energy Regulator under the *Renewable Energy (Electricity) Act 2000* (Cth)

Under this approach, the role of the Clean Energy Regulator is expanded to set and ensure compliance with CER technical standards on a nationally consistent basis. This could be done under the *Renewable Energy (Electricity) Act 2000* (Cth).

The benefit of this approach would be the ability to leverage the Clean Energy Regulator's existing regulatory relationships with OEMs and installers, neither of which are regulated under the NEL.

This approach would lead to a nationally comprehensive framework for CER technical standards. By comparison, amendments to the NEL would result in regulatory reform that only affects jurisdictions participating in the NEM.

Further, the Clean Energy Regulator has existing resourcing and experience in monitoring and enforcing technical requirements on individual CER devices. This is more in line with future work to enforce CER technical standards, compared with the AER's functions to date under the NEL.

The limitation with this approach is the need to expand the Clean Energy Regulator's focus from a financial subsidy program to consideration of broader power system issues. This would likely require a significant investment in resources and technical expertise by the Clean Energy Regulator. For example, the Clean Energy Regulator would need to engage with power grid interests from CER technical standardisation.

This approach would require the Clean Energy Regulator to contribute to the development of new or updated CER technical standards. There would need to be a clear process for setting new or updated standards as the market and technology evolves.

All of these additional functions would create the risk of duplicating core functions by market bodies.

A further limitation is the policy uncertainty regarding the Clean Energy Regulator's longer-term role in the regulation of small-scale renewable generation units.

4.2.4 Option four: enforce national requirements under jurisdictional frameworks

Under this approach, jurisdictions agree that existing and relevant bodies established under local jurisdictional frameworks apply and enforce CER technical standards. Jurisdictions would coordinate to ensure national consistency in the setting and enforcement of standards.

This approach would consist of the AEMC continuing to introduce, as needed, new or updated CER technical standards in the NER and/or NERR. However, to promote increased compliance, jurisdictions would commit to directing regulators under jurisdictional frameworks to enforce requirements in the NER.

The benefit of this approach would be the ability to leverage existing institutions, and a reduced risk of creating duplicate interactions between NEM and jurisdictional regulatory frameworks.

A possible disadvantage of this approach would be the significant risk of enforcement gaps and inefficiencies arising due to the differing institutional arrangements in force across jurisdictions. This results from the substantial variations, and gaps, in institutional arrangements for CER technical standards as established under jurisdictional frameworks.

There would be the risk of unclear accountability for consistent performance against national outcomes, and a potential lack of alignment between the national energy objectives and outcomes under local frameworks. To avoid this,there would need to be a mechanism to coordinate all the state-based regulators.

Further, this option risks creating significant new complexity in the overall arrangements for setting and enforcing CER technical standards. The large number of institutions acting in parallel would risk inconsistency from jurisdiction to jurisdiction, reducing the economic benefit from a more streamlined regulatory approach offered by other reform options.

4.3 Summary of draft recommendations

The Commission's draft recommendation was for jurisdictions to consider if further regulatory reform was needed due to any residual non-compliance following implementation of the immediate actions under the existing framework.[57]

The draft report recommended jurisdictions determine:[58]

57 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 39.

58 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 39.

- if reform of national technical regulation is needed and, if so,
- the most appropriate reform model for setting and enforcing CER technical standards.

If jurisdictions considered further reform was needed, the work should consist of four tasks.[59]

- Identify the need for new regulatory functions — the specific tasks or responsibilities necessary to bring stakeholders and frameworks together
- Define and consult on regulatory options to address identified gaps and needs
- Clarify implementation requirements
- Assess the costs and benefits of reform options.

For more on the four tasks as originally set out by the AEMC, see the draft report.[60]

4.3.1 Stakeholder views

No stakeholders opposed the recommendation to progress reform of the regulatory framework for CER technical standards. [61]

There was also widespread support for jurisdictions, rather than market bodies, progressing reform.[62]

New South Wales and Queensland DNSPs, along with ENA, supported national reform. However, these stakeholders held some reservations about the willingness and timeliness of jurisdictions to shift regulatory functions from the state to national level.[63] Until such a shift occurred, New South Wales DNSPs recommended instead that jurisdictions adopt a state-based approach to enforcing CER technical standards.[64]

The Government of South Australia's Department for Energy and Mining supported national consistency as an objective of regulatory reform. However, it further submitted that reform would need to account for jurisdiction-specific issues given the pace at which consumers are adopting new CER technologies and services.[65]

Further, several stakeholders wanted regulatory reform to consider the full range of functions required to develop, introduce and implement existing and future CER technical standards.[66]

4.3.2 Commission response

The Commission recognises strong stakeholder interest in jurisdictions reforming the regulatory framework for CER technical standards. It also recognises that, given the largely voluntary nature of immediate actions recommendations, they are unlikely to be enough to

59 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 39.
60 AEMC, Review into consumer energy resources technical standards, draft report, 27 April 2023, pp. 39-44.
61 See all 23 written submission to the draft report.
62 Submissions to the draft report: AGL, p. 1; AEMO, pp. 3-4; AER, pp. 2-3; CEC, p. 9; Citipower, Powercor and United Energy, pp 3-4; ECA, p. 3; ENA, p. 2; Joint OEMs, p. 2; NSW DNSPs, p. 2; PIAC, p. 4; SA Power Networks, p. 4; SwitchDin, pp. 1-3;
63 Submissions to the draft report: ENA, p. 2; Ergon and Energex, p. 2; NSW DNSPs' submission to the draft report, p. 2.
64 NSW DNSPs' submission to the draft report, p. 2.
65 Government of South Australia submission to the draft report, p. 8.
66 Submissions to the draft report: AGL, p. 1; Ausnet, p. 1; ENA, p. 1; Origin, p. 1; PIAC, p. 1; SA Power Networks, p. 1; TasNetworks, p. 1.

achieve the near-universal compliance of new connections that is required. AEMO, for example, considers that to achieve its target of at least 90 per cent of new connections complying with AS4777.2:2020 reform is needed in parallel with immediate action under the existing framework.[67] This is particularly important given the expected rise in new CER connections — namely, electric vehicles — in coming years.

The final recommendation is that jurisdictions immediately commence work on regulatory reform to establish the preferred model for a national approach for CER technical standards.

In response to the suggestion that jurisdictional frameworks could be relied upon to enforce national CER technical standards, the Commission has put forward a new regulatory reform option for consideration by jurisdictions. This option contemplates jurisdictional enforcement of NEM-wide requirements.

This report also calls for this jurisdictional reform work to consider the full range of functions needed to set and enforce CER technical standards. This recognises the closely related nature of functions at each stage in the standardisation process. It also recognises the likely need for future CER technical standards given continuing consumer interest in these devices.

67 AEMO submission to the draft report, p. 2.

5 RECOMMENDATIONS UNDER THE EXISTING FRAMEWORK

In chapter 4, the Commission recognises the need for jurisdictions to progress reforms to establish an enduring framework for CER technical standards. In parallel with these reforms, the Commission considers that industry and market bodies should also take immediate actions to improve compliance in parallel.

These immediate actions are critical to improve compliance and provide benefits to consumers in the short term. However, the benefits of these actions are limited and are unlikely to lead to long-term universal and enduring compliance. Nevertheless, it is still very important to undertake these actions now while longer-term reform is developed.

This chapter outlines the final 10 recommendations for immediate actions across the CER device life cycle that can be progressed by industry and market bodies without amendments to the NEL or NER.

If stakeholders implement all of the immediate actions recommended in the chapter, in full, the Commission estimates that the NEM could achieve near-universal compliance of new connections with CER technical standards.[68]

5.1 Stage one: simplify devices at manufacture and supply

This section outlines final recommendations that will help reduce the likelihood of non-compliance before progressing to the device installation and operation stage. These recommendations require voluntary actions from OEMs to implement.

The voluntary basis for the recommendations recognises the AEMC's limited ability to impose mandatory obligations on OEMs.

BOX 4: RECOMMENDATIONS AT THE MANUFACTURE AND SUPPLY STAGE

Recommendation 2: OEMs make AS 4777.2:2020 'Region A' (mainland NEM jurisdictions) the default 'top of the list' setting on new CER devices.

Recommendation 3: OEMs remove historical versions of NER CER technical standards from the settings menu for the inverter on new CER devices to the extent possible, while maintaining obligations to meet the terms of the warranty.

Recommendation 4: The CEC incorporates existing and any future NER CER technical standards, as they are developed, in the requirements for approved sellers voluntarily participating in the New Energy Tech Consumer Code (NETCC).

68 For more on the estimated impact of immediate actions on compliance rates, see AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, pp. 13-14.

5.1.1 Recommendation 2: Make 'Region A' the default device setting

The Commission's final recommendation is for OEMs to make AS 4777.2:2020 'Region A' (mainland NEM jurisdictions) the default setting. This means 'Region A' should top the list of available options on the device settings menu. This is consistent with the review's draft recommendation.

Summary of draft recommendation

The draft recommendation was for OEMs to make AS 4777.2:2020 'Region A' (which is relevant for mainland NEM jurisdictions) the default setting on new CER devices.[69]

The purpose was to streamline the installation process and reduce confusion among installers, in support of compliant installation.[70]

Stakeholder views

Most stakeholders supported the draft recommendation and submitted it would make it easier to install devices in compliance with CER technical standards.[71]

The joint submission from OEMs wanted to clarify that default means the setting is the first option on a list of multiple options, rather than the only option in the settings menu.[72] For example, according to a joint OEM submission, mandating a default product is sold 'out-of-the-box' ready for Region A is not practical for global OEMs selling products into multiple markets across jurisdictions and would require manufacturing an Australia specific product. OEMs instead requested the AEMC clarify the final recommendation requires manufacturing devices so that 'Region A' is the first option for an Australian system.

The joint OEM submission further noted that the recommended approach is being considered through the standards development process as an update to AS 4777.2.[73] If AS4777.2 is updated the new version of the standards would be automatically introduced in the NER, which calls up the latest version of AS4777.2.[74]

Commission response

The final recommendation maintains the approach in the draft report. In response to stakeholder submissions, the Commission clarifies that making 'Region A' the default setting means this setting should be the first option in the list for devices sold in Australia.

It is important to note that 'Region A' represents mainland NEM jurisdictions, which collectively pose the greatest system risks from non-compliance. This prioritisation of Region A will therefore support compliant installation for most NEM consumers.

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69 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 18.

70 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 18.

71 Submissions to the draft report: CEC, p. 3; AEMO, p. 3; AER, p. 2; Origin, p. 4; PIAC, p. 3; SA Government, p. 4 and NSW DNSPs, p. 3.

72 Joint OEMs' submission to the draft report, p. 3.

73 Submission to the draft report, p. 4.

74 For more, see Box 1.

5.1.2 Recommendation 3: Remove historical device settings

The Commission's final recommendation is OEMs remove historical versions of NER CER technical standards from the settings menu for the inverter on new CER devices, to the extent possible, while maintaining obligations to meet the terms of the warranty While some OEMs may need to take a flexible approach to account for warranty requirements in other jurisdictions, the final recommendation is largely consistent with the approach set out in the draft recommendation.

Summary of draft recommendation

The draft recommendation was for OEMs to voluntarily remove historical versions of CER technical standards from the settings menu for new CER devices.[75]

The purpose of this draft recommendation was to make the current version of NER CER technical standards the only version available for selection by the installer when connecting a CER device to a distribution network.[76]

Stakeholder views

Stakeholder submissions in response to the draft report generally supported the draft recommendation. It was considered relatively low cost and simple to implement. OEMs noted in that the proposed changes to simplify devices are already being considered through the standards development process in proposed updates to AS 4777.2[77]

The OEM SMA noted in its individual submission that some historical settings are required if selling the same devices in New Zealand and the Pacific islands.[78] SMA noted that it sells some of its CER devices into both Australian markets, and in New Zealand and several Pacific island nations.[79] Regulatory requirements in New Zealand and the Pacific require maintaining historical versions of AS 4777.2 as AS4777.2:2020 has not been adopted.[80] It further noted the need to maintain the option of selecting historical versions of standards to meet certain warranty requirements.[81]

Commission response

The Commission's final recommendation is consistent with the draft recommendation, whilst clarifying that the recommendation is subject to the need for the OEM to meet warranty obligations for each market the device is sold. The final recommendation recognised that OEM requires flexibility to maintain historical versions of CER technical standards in their devices so that they can meet regulatory requirements in other jurisdictions in which the device is sold.

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75 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 16.
76 AEMC, *Review into consumer energy resources technical standards*, draft report, p. 17.
77 Joint OEMs' submission to the draft report, p. 3.
78 SMA submission to the draft report, p. 1
79 SMA submission to the draft report, p. 1
80 SMA submission to the draft report, p. 1.
81 SMA submission to the draft report, p. 1.

Removing historical device settings would 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.

5.1.3 Recommendation 4: Incorporate new and future CER technical standards in the NETCC

The Commission's final recommendation is for the CEC to incorporate, over time, compliance with CER technical standards in the NER as a code requirement for voluntary participants in the NETCC. This is intended to be a dynamic process by which the NETCC evolves with market and regulatory conditions. That is, under the final recommendation, the CEC's administration of the Code would evolve in line with both NER requirements and the Code's effectiveness as a referral service for consumers interested in buying and connecting new CER devices to the power grid.

The NETCC is a relatively new initiative administered by the CEC. As a form of industry self-regulation, participants in the Code (approved sellers) voluntarily agree to meet certain minimum requirements. In return, the service refers customers intending to purchase CER devices to recommended OEMs and installers. For more on the NETCC, see Box 5.

In its existing form, the NETCC requires in general terms that participants comply with relevant Australian Standards. However, compliance with specific standards such as AS4777.2:2020 is not explicitly required for NETCC participation.

The Commission recognises that the NETCC is still in its infancy, and that explicitly requiring compliance with CER technical standards in the NER would likely require an amendment to the ACCC authorisation under which the CEC administers the Code. There may also be short-term resourcing implications for the CEC, depending on the pace at which CER technical standards are explicitly required as requirement for NETCC participation. The Commission nevertheless considers there is a benefit for NEM consumers in the CEC working with its members, and other interested stakeholders, to evolve the NETCC in line with prevailing NER requirements. This would maximise the extent to which OEMs and installers recommended to consumers by the NETCC are contributing to overall compliance with CER technical standards in the NEM.

Summary of draft recommendation

The draft recommendation was for the to CEC introduce compliance with NER CER technical standards as a requirement to be listed as an 'approved seller' following NETCC amendments.[82]

This draft recommendation was intended to support customers in finding and selecting a seller of CER devices that promotes compliance with any CER technical standards prevailing in NER at the time of purchase. In other words, the draft recommendation intended to

82 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 22.

reduce the likelihood of consumers being directed towards devices and installers contributing to non-compliance with CER technical standards.[83]

Implementation by the CEC, as the body responsible for administering the NETCC, was intended to be voluntary as the Commission recognised it cannot impose obligations on the CEC under the NER or NERR.[84]

Stakeholder views

Several DNSPs supported the draft recommendation in written submissions.[85]

However, NSW DNSPs considered the recommendation was more appropriately targeted at device suppliers than installers.[86]

The CEC was concerned that compliance with CER technical standards would be better addressed through existing jurisdictional frameworks for the installation of CER devices.[87] Energy Consumers Australia (ECA) was also concerned that the CEC would not be able to implement the draft recommendation.[88]

Instead of introducing CER technical standards as a requirement for participating in the NETCC, the joint submission from OEMs considered it preferable to instead focus on reforms to the process for developing and setting CER technical standards.[89]

Commission response

The Commission's decision to maintain the approach in the draft report, with minor changes for the final determination, reflects the support of most stakeholders for the NETCC contributing to compliance with CER technical standards.

The main reason for maintaining a role for the NETCC in the final recommendations is based on consumer expectations. The Commission considers it reasonable for prospective purchasers of CER devices to consider that an NETCC approved seller, is to the maximum extent possible, complying with all relevant minimum standards and regulatory requirements. It is important to note that, if the NETCC does not evolve in line with NER requirements, it would be possible for an approved seller to provide and install a CER device that does not comply with CER technical standards. All else being equal, this would leave the consumer vulnerable to disconnection by the relevant DNSP.

Nevertheless, in recognition of several implementation concerns raised by submissions, the final recommendation:

- reflects the NETCC's intended focus on suppliers of CER devices

83 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 22.
84 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 22.
85 Submissions to the draft report: Citipower, Powercor and United Energy, p. 2; NSW DNSPs, p. 4; SA Power Networks, p. 2.
86 Submission to the draft report, p. 4.
87 Submission to the draft report, p. 4.
88 Submission to the draft report, p . 2.
89 Submission to the draft report, p. 5.

- better adheres to principles of good regulatory practice. The final recommendation sets out principles for the CEC's evolving administration of the NETCC. This compares with a more prescriptive approach to describing the CEC's role in the draft recommendation.
- provides greater flexibility for the CEC to administer the NETCC. The Commission reiterates its interest in the NETCC evolving in line with market and regulatory conditions in the NEM, but acknowledging that these updates can be achieved over a reasonable period, without necessarily seeking an immediate update to its ACCC authorisation.

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
- 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 bio energy 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 ACCC. 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 (PIAC), Energy Consumers Australia, Energy Networks Australia, Renew and Consumer Action Law Centre.

Source: Clean Energy Council, *About the NETCC: frequently asked questions*, February 2023; Baker McKenzie, *Review into CER technical standards: appendix to the draft report*, 27 April 2023, p. 22.

5.2 Stage two: promote compliant installation

This section sets out the Commission's final recommendations to improve compliance at the installation stage in the device life cycle.

BOX 6: RECOMMENDATIONS AT THE INSTALLATION STAGE

Recommendation 5: NER CER technical standards training be mandatory for accreditation under the Commonwealth's SRES. This would be undertaken by entities administering SRES accreditation.

Recommendation 6: Jurisdictions to provide funded training on NER CER technical standards for installers.

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.

Recommendation 8: DNSPs to introduce a commissioning process to better standardise the process across the NEM for verifying correct device installation before connecting new CER devices to the grid.

5.2.1 Recommendation 5: Mandate CER technical standards training for SRES accreditation

The Commission's final recommendation is for mandatory training on any CER technical standards in the NER for accreditation under the Commonwealth's SRES. The training would be mandated by entities administering SRES accreditation. This approach is consistent with the draft recommendation.

For more on the SRES, see Box 7.

BOX 7: 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 prescribe eligibility requirements in respect of the creation of STCs for small systems, including compliance with relevant technical standards. For example:

- the device 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 AS4777.2:2020, 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 AS4777.2:2020.

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 AS4777.2:2020. 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 to the draft report*, 27 April 2023, pp. 32-36.

Summary of draft recommendation

The draft recommendation was for NER CER technical standards training to be mandatory for accreditation under the SRES.[90]

The purpose of promptly implementing this draft recommendation was 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 AS4777.2:2020.[91]

The Commission considered this draft recommendation is able to implemented on a voluntary basis by the CEC as soon as possible. The CEC was the entity responsible for administering SRES accreditation at publication.[92] However, the recommendation would apply to whichever entity is responsible for administering installer accreditation under the SRES.

Stakeholder views

Most stakeholders supported this draft recommendation but noted some potential limitations in its implementation.

The CEC, Origin and OEMs noted that mandating CER technical standards training for SRES accreditation would only extend training to the installation of solar inverters.[93]

The CEC further noted in its submission that the maturity of the SRES may hinder the drive for improved compliance.[94] Given the RET scheme is concluding in 2030, and STCs are reducing in value every year, using the SRES as a means of motivating installers to comply with CER technical standards may lose its motivation given the reducing monetary value associated with the scheme.

Commission response

The Commission's final recommendation is to maintain the draft recommendation. The Commission recognises the limitations highlighted by stakeholders. However, the action is intended to complement other actions recommended over the device life cycle.

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

90 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 24.
91 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 24.
92 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 24.
93 Submissions to the draft report: CEC, p. 5; Origin p. 3; Joint OEMs p. 5.
94 CEC submission to the draft report, p. 5.

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, from consumers.

5.2.2 Recommendation 6: Funded training on CER technical standards for installers

The Commission's final recommendation is for jurisdictions to provide funded training for installers on CER technical standards. This is largely consistent with the draft recommendation, which canvassed the possibility of jurisdictions or DNSPs funding the training.

Summary of draft recommendation

The draft recommendation was for jurisdictions and/or DNSPs to provide funded training on NER CER technical standards for installers.[95]

The training was intended to assist installers in understanding obligations in installing and commissioning new systems. This would reduce the likelihood of non-compliant installations occurring.[96]

Stakeholder views

Almost all stakeholders expressed support for this draft recommendation, noting the importance of a device being correctly configured before being operational. Stakeholders noted that mandatory funded training on CER technical standards for installers is recommended to address gaps in mandatory installer training caused by evolving technical requirements.

OEMs, PIAC and the CEC noted that given the speed and frequency of additional or new technical requirements for installers mandatory funded annual training should be implemented to ensure an ongoing minimum threshold of knowledge.[97]

ECA noted in their submission that training for installers should be a key part of the proposed policy framework and incorrect installations play a big role in noncompliance, largely due to confusion around applying the correct setting.[98] Ensuring devices are set up correctly at the point of installation reduces the need for intervention in the later parts of the device life cycle, which often puts the onus on consumers to know and understand what non-compliance means for their device, and the added inconvenience that comes with needing to remedy their device if this cannot be done remotely.

Most stakeholders wanted clarity on whether DNSPs or jurisdictions would be funding the training.

95 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, pp. 27-28.
96 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 27.
97 Submissions to the draft report: Joint OEMs, p. 6; PIAC, p. 4; CEC p. 6.
98 ECA submission to the draft report, p. 2.

Commission response

The Commission's final recommendation is to maintain the draft recommendation but clarify that the training should be funded by jurisdictions.

Stakeholders universally support this recommendation to increase compliance and agree that the benefits associated would significantly outweigh the costs.

The Commission considered jurisdictions best positioned to implement this recommendation promptly and flexibly. This is an important consideration given that immediate actions are intended to provide for interim compliance improvements while regulatory reform progresses.

Oakley Greenwood's assessment should provide additional assurance that efforts to improve compliance during installation, such as increased training opportunities for installers, are in the economic interest of electricity consumers. This is due to the substantial economic benefits from improved compliance with CER technical standards.[99]

5.2.3 Recommendation 7: Guidance on CER technical standards for installers

The Commission's final recommendation is for the CEC to publish and make available guidance material for installers on correct configuration of CER devices. This would be done by the CEC voluntarily as a form of industry self-regulation. The final recommendation is consistent with the draft recommendation.

Summary of draft recommendation

The draft recommendation was for the CEC, as a prominent industry body representing installers of CER devices, to publish and make freely available guidance material for installers on configuring devices in compliance with NER CER technical standards.[100]

Stakeholder views

Most stakeholders supported this recommendation as a simple and cost-effective way to increase information for installers. Some stakeholders further noted that guidance on CER technical standards for installers is helpful, but the entity or process best suited to provide this guidance needs further consideration.

The CEC noted that the role of providing freely available guidance material for installers will become the responsibility of the successful tenderer and be included in contracts between the Clean Energy Regulator and its new service provider.[101] The CEC further noted, however, that it will continue their role supporting installers through education, training and support services.

Commission response

The Commission maintains the draft recommendation that the CEC publish and make freely available guidance material for installers to support configuring devices in compliance with

99 Oakley Greenwood, *Benefits of CER compliance: CER technical standards*, 23 August 2023.
100 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 29.
101 CEC submission to the draft report, p. 6.

NER CER technical standards. This would be done by the CEC voluntarily as a form of industry self-regulation.

As an industry body, the CEC would 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 requirements of NER CER technical standards would be a relatively low-medium cost way of providing for greater market transparency.

This approach would also balance the information asymmetry between installers and the DNSPs regarding network requirements.

5.2.4 Recommendation 8: Introduce commissioning process for CER

The Commission's final recommendation is for DNSPs to introduce a commissioning process for new CER connections, to verify compliance with CER technical standards before the device is connected to the distribution network. This is largely consistent with the draft recommendation, however the Commission clarifies the process does not need to rely on a physical sheet of paper. Digital processes can be adopted by DNSPs to verify compliance of new connections.

Summary of draft recommendation

The draft recommendation was for DNSPs to introduce commissioning sheets that include step by step good practice guidance for successful installation of CER devices.[102] The commissioning sheets would also require responses from the installer to show the DNSP and the customer that the device has been properly configured.[103]

This draft recommendation aimed to reduce the likelihood that devices are incorrectly installed and therefore non-compliant with CER technical standards.[104]

The Commission did not recommend any amendment to the NER and/or NERR to oblige DNSPs to take this action. It did not consider DNSPs being prevented by the NER or the NERR from introducing commissioning sheets; doing so would be good practice.[105]

102 AEMC, *Review into consumer energy resources technical standards*, draft report, p. 30.

103 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.

104 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 30.

105 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 30.

Stakeholder views

Stakeholders were generally supportive of this recommendation with Citipower, Powercor and United Energy, SA Power Networks, AEMO, PIAC, SA Government and the AER strongly supporting the practice because it provides them with oversight and a hook for installers.[106]

CitiPower, Powercor and United Energy and AEMO noted commissioning sheets are an important tool available to distributors to ensure that CER devices are installed and commissioned compliantly.[107] CitiPower, Powercor and United Energy further noted in its submission that since introducing commissioning sheets in October 2022 it has seen a positive impact on installer behaviour and compliance in their networks. Citipower, Powercor and United Energy noted its networks are now averaging around 80 per cent of valid documents being provided each week.[108]

However, OEMs raised concerns the recommendation could replace bespoke installation instructions.[109] The joint OEM submission noted the recommendation has the potential to be problematic for installers if the DNSP commissioning sheet inadvertently contradicts anything in the OEM installation manual for different products. They noted that different OEMs have different commissioning processes, so it may not be possible to create a single CER commissioning sheet, even one broken down by different product types.

Commission response

The Commission's final recommendation is to maintain the draft recommendation whilst clarifying that a 'commissioning sheet' does not necessarily refer to a physical sheet of paper but any digital or physical process that allows the installer to demonstrate compliance is sufficient.

The introduction of a commissioning process 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.

To alleviate concerns from OEMs, about the potential for the commissioning process to contradict installation instructions for specific devices, the Commission encourages DNSPs to consult with industry (particularly OEMs) when establishing the commissioning process.

The AER has committed to this recommendation as part of its guidance to DNSPs on prudent and efficient expenditure in support of integrating CER in distribution networks. Expenditure on the commissioning process would be considered an efficient alternative to network

106 Submissions to the draft report: Citipower, Powercor and United Energy, p. 3; SA Power Networks, p. 3; AEMO, p. 5; SA Government, p. 5; AER, p. 2.

107 Submissions to the draft report: CitiPower, Powercor and United Energy, p. 3 and AEMO p. 3.

108 CitiPower, Powercor and United Energy submission to the draft report, p. 3.

109 Joint OEMs' submission to the draft report, p. 7.

investment and other expenditure to manage voltage fluctuations associated with non-compliance.[110]

5.3 Stage three: support ongoing compliance

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

In the draft report, the Commission recommended that retailers should accelerate the deployment of smart meters with improved data access for DNSPs to monitor compliance with CER technical standards. Following the publication of the *metering review*, the Commission considers that this measure is not required to be an explicit recommendation from this report. The required monitoring and reporting of CER technical compliance will be fully achieved by the recommendations of the *metering review* which improves access to data for distribution networks.[111]

> BOX 8: RECOMMENDATIONS AT THE ONGOING OPERATION STAGE
>
> **Recommendation 9**: OEMs to voluntarily update devices remotely where possible to remedy non-compliance with NER CER technical standards.
>
> **Recommendation 10**: OEMs to provide data to DNSPs and AEMO to better support monitoring of non-compliance.
>
> **Recommendation 11**: Jurisdictions to subsidise re-configuration, remote update or re-installation of non-compliant CER devices on behalf of consumers.

5.3.1 Recommendation 9: Update devices remotely to support compliance

The Commission's final recommendation is for OEMs to voluntarily update devices remotely where possible to remedy non-compliance with NER CER technical standards. This is largely consistent with the draft recommendation. However, the recommendation has been shifted to stage three in recognition of the role of OEM data in supporting the ongoing operation of CER devices connected to the power grid.

Summary of draft recommendation

The draft recommendation was for OEMs to remotely update devices, where possible, to remedy non-compliance with NER CER technical standards.[112]

110 AER submission to the draft report, p. 2.
111 AEMC, *Review of the regulatory framework for metering services*, final report, 30 August 2023.
112 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 19.

The purpose of this draft recommendation was to assist DNSPs in their role of monitoring ongoing CER compliance through updates that automatically comply with NER CER technical standards.[113]

Voluntary adoption of this draft recommendation was sought from OEMs as the Commission cannot place direct obligations on OEMs through the NER or NERR as they are not NEM participants.[114]

Stakeholder views

Most stakeholders expressed support for this recommendation, noting that this action is generally low-cost and in the best interest of all parties in the supply chain.

OEMs in their joint submission noted, however, that updating devices remotely to support compliance is primarily an installation issue and should be considered post-installation.[115] They note that this is technically not an OEM problem to fix, however, many OEMs have voluntarily, and at their own cost, implemented a process to have all non-complaint inverters re-set to the correct regional setting.

Commission response

The Commission's final recommendation is to maintain the draft recommendation. The Commission acknowledges this recommendation as an action for ongoing operations rather than an immediate action. This is due to remote updates occurring when the device is installed rather than in the manufacturing stage of a device.

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. There is widespread support for including this recommendation as an action to improve compliance. The Commission recognises the value of this action and the positive impact it can have on improving compliance.

5.3.2 Recommendation 10: Access to OEM compliance data

The Commission's final recommendation is for OEMs to provide data to DNSPs and AEMO to better support the monitoring of non-compliance. This is consistent with the draft recommendation.

Summary of draft recommendation

The draft recommendation was for OEMs to provide CER device compliance data to DNSPs and AEMO.[116]

113 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 19.
114 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 19.
115 Joint OEMs' submission to the draft report, p. 3.
116 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 35.

The purpose of the draft recommendation was to enable DNSPs and AEMO to better monitor compliance with CER technical standards and therefore be in a better position to take action to rectify identified instances of non-compliance.[117]

The Commission considered the draft recommendation could 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.[118]

Stakeholder views

All stakeholders broadly support this recommendation to improve compliance, however, noted the voluntary nature of this recommendation due to the AEMC's limited powers.

AEMO and Citipower, Powercor and United Energy strongly supported this recommendation as the implementation of this recommendation by OEMs will streamline this installation process and reduce confusion for installers.[119] AEMO noted in its submission that it continues to work closely with OEMs to gather data on compliance with CER technical standards.[120]

OEMs in their joint submission noted access to OEM compliance data through a common communication protocol like CSIP-AUS is recommended.[121]

Commission response

The Commission's final recommendation is to maintain the draft recommendation that OEMs provide data to DNSPs and AEMO to better support the monitoring of non-compliance. 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 contribute to improving compliance rates and the overall performance of CER devices at a network level as well as for individual consumers.

Preliminary conversations with AEMO, OEMs and DNSPs indicate this action is already being progressed to a significant extent, with data shared on request by the vast majority of OEMs. Both AEMO and DNSPs continue to work closely with OEMs to gather and analyse compliance data.

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117 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 35.
118 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 35.
119 Submissions to the draft report: CitiPower, Powercor, United Energy, p. 2; AEMO p. 2.
120 AEMO, submission to the draft report, p. 2.
121 Joint OEMs' submission to the draft report, p. 3.

5.3.3 Recommendation 11: Subsidised re-configuration of non-compliant devices

The Commission's final recommendation is for jurisdictions to subsidise re-configuration, remote update or re-installation of non-compliant CER devices on behalf of consumers. This is largely consistent with the draft recommendation. However, it calls for DNSPs to fund re-configuration to the extent required rather than jurisdictions.

Summary of draft recommendation

The draft recommendation was for jurisdictions to consider the option of subsidising the re-configuration of non-compliant CER devices.[122]

The Commission considered that the purpose of implementing the draft recommendation was to relieve the burden on consumers to ensure devices comply with NER CER technical standards, and thereby improve overall compliance rates.[123]

Stakeholder views

There is general support for this recommendation, with the CEC, PIAC, ECA, and SwitchDin all expressing support for this recommendation, since the burden of responsibility is not placed upon the consumer.[124]

SA Power Networks and Origin did not support the recommendation in part due to concern it would undermine incentives for compliant installation.[125] SA Power Networks further submitted that instead of subsidising the cost of re-configuration of non-compliant devices, a more appropriate solution would be to provide DNSPs with the right to disconnect the non-compliance CER until it is rectified.[126] SA Power Networks considered this alternative approach would be more consistent with DNSPs approach with larger CER installations.[127]

OEMs in their joint submission noted the need to make sure this action does not create incentives for non-compliance.[128] They outlined the need to explore further what this option might look like to ensure it is not developed in a way that potentially results in an increased non-compliance risk. They believe the installers are responsible for installation and software commissioning and this issue is related to improved education and training.

Commission response

The Commission's final recommendation is to maintain the draft recommendation regarding the subsidisation of re-configuration, remote update, or re-installation of non-compliant CER devices on behalf of consumers. However, the Commission proposes to incorporate a condition to ensure that this subsidy only applies to devices installed before a specific date.

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122 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 37.
123 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023, p. 37.
124 Submissions to the draft report: CEC, p. 8; PIAC p. 4; ECA, p. 2; SwitchDin, p. 9.
125 Submissions to the draft report: SA Power Networks, p. 4 and Origin p. 6.
126 SA Power Networks submission to the draft report, p. 4.
127 SA Power Networks submission to the draft report, p. 4.
128 Joint OEMs' submission to the draft report, p. 3.

The purpose of this condition is to avoid creating a disincentive for non-compliant installations. By setting a cut-off date, jurisdictions can incentivise timely compliance while also providing support for consumers who have already installed non-compliant CER devices. This approach strikes a balance between promoting compliance and ensuring fairness for consumers who may have unknowingly installed non-compliant devices.

The Commission recognises the importance of helping consumers and encouraging the adoption of compliant CER devices. By subsidising the re-configuration, remote update, or re-installation of non-compliant devices, jurisdictions can help alleviate the financial burden on individual consumers and facilitate the transition to compliant technologies.

The Commission considers subsidies for existing connections, rather than disconnection, more appropriately reflects the way in which consumers engage with CER. It is not practical to expect most device owning consumers monitor and enforce technical requirements such as compliance with AS4777.2:2020.

The recommendation is intended to provide an alternative to costlier investment in upstream network infrastructure and ancillary service markets to manage voltage fluctuations as a result of existing non-compliant connections.

ABBREVIATIONS AND DEFINED TERMS

AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ARENA	Australian Renewable Energy Agency
ARENA DEIP	Australian Renewable Energy Agency Distributed Energy Integration Program
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
DNSP	Distribution network service provider
ECA	Energy Consumers Australia
EAP	Energy Advisory Panel
ESB	Energy Security Board
EV	Electric vehicle
FCAS	Frequency control ancillary services
MCE	Ministerial Council on Energy
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
TNSP	Transmission network service provider

A SUMMARY OF OTHER ISSUES RAISED IN SUBMISSIONS

This appendix sets out the issues raised in the second 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, it has not been included in this table.

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

STAKEHOLDER	ISSUE	AEMC RESPONSE
Evergen	CER technical standards vary in their impact and benefits to the grid, and should not be subject to uniform standards (p. 4).	This is outside the scope of this review, which is focused on compliance and enforcement of CER technical standards, including existing requirements under the NER. It could be considered as part of the proposed work on standards development in the future.
NSW DNSPs	The recommendations should allow DNSPs to make settings for newer CER installations to permit dynamic export limits (p. 6).	The AER has recently considered the implementation of flexible export limits for CER installations. For more, see the *Review of regulatory framework for flexible export limit implementation* (31 July 2023).
Rheem	Evaluate the ability of the current framework to address the impending "future state" use cases. These use cases will include Dynamic Operating Envelopes, Dynamic Export Limits, EV charger standards, cyber security standards, and device interoperability (pp. 1-2).	The AEMC will continue working with jurisdictions and other energy market bodies on the interaction of future NEM needs from CER technical standards. This is outlined in the AEMC's work plan for the technical integration of CER. This is intended to complement work already underway such as ARENA's Distributed Energy Integration Program.
SwitchDin	Enable a process for ongoing guidance on	This issue could be considered by jurisdictions in

STAKEHOLDER	ISSUE	AEMC RESPONSE
	operational matters, including interpretation of standards (p. 4).	progressing regulatory reform. To date, the AEMC has not been made aware of specific differences in the interpretation of existing standards in the NER as would necessitate specific action under the recommendations set out in this review.

B POTENTIAL IMPROVEMENT IN COMPLIANCE

Through this review, the Commission has identified reasons for non-compliance across three distinct stages in the life cycle for CER devices — manufacture and supply, installation, and ongoing operations.[129]

In the draft report, the Commission considered the market impacts of significant non-compliance across the NEM, NT, and WA. This analysis focused on three specific impacts:[130]

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

The technical assessment below builds on the draft report's analysis by considering the impact of recommendations on fleet-wide compliance rates with CER technical standards.

B.1 Modelling fleet-wide compliance with CER technical standards

The Commission has considered the fleet-wide implications of non-compliance with CER technical standards. Some of the questions considered as part of this modelling exercise include:

- What does the significant non-compliance of new connections mean for the performance of all CER devices connected to the NEM?
- What kind of improvements in the performance of fleet-wide device performance can be expected given the significant number of CER devices already connected to the power grid? This is driven by a consideration that the updated version of AS4777.2:2020, which requires voltage ride through, only commenced on 18 December 2021.[131]

The purpose of the model was to forecast the total number of AS 4777.2:2020 compliant inverters and fault-ride-through requirements by 2027. The Commission modelled both requirements because fault-ride-through does not necessarily imply compliance with AS 4777.2:2020 as inverters that were installed before the 2020 standard was introduced were capable of some level of voltage ride through. However, all inverters that are compliant with AS 4777.2:2020 are assumed to be compliant with fault ride-through requirements. I.e., AS 4777.2:2020 is a subset of solar PV inverter fault ride-through compliance (see figure below).

129 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023.
130 AEMC, *Review into consumer energy resources technical standards*, draft report, 27 April 2023.
131 This is also the date on which CER technical standards commenced in the NER.

Figure B.1: More devices ride through voltage disturbances than comply with AS4777.2:2020

Source: AEMC.

B.1.1 Three compliance scenarios

Using AEMO's public reporting as the starting point, a baseline compliance level of 37 per cent of new CER connections is estimated for AS 4777.2:2020.[132] Up to 50 per cent of inverters are susceptible to shake-off (that is, not riding through voltage disturbances) during deep network faults.[133] For the purposes of the model, this means 50 per cent of inverters that do not comply with AS 4777.2:2020 are also susceptible to shake-off after faults.

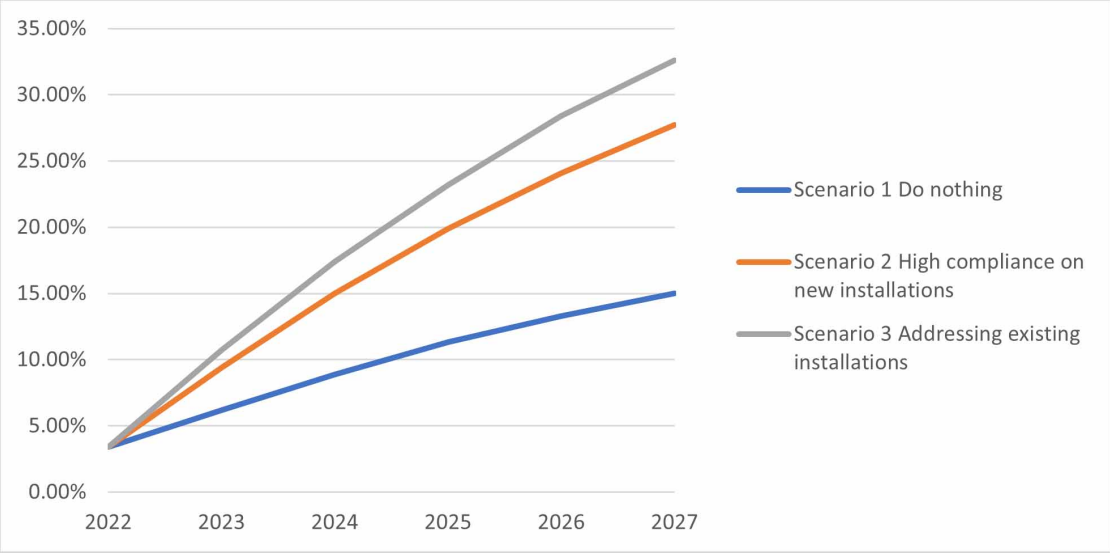
The model considers three scenarios:

132 AEMO, Compliance of Distributed Energy Resources with Technical Settings, April 2023. For more information, see here: https://aemo.com.au/-/media/files/initiatives/der/2023/compliance-of-der-with-technical-settings.pdf?la=en.

133 AEMO, Behaviour of distributed resources during power system disturbances, May 2021. For more information, see here:https://aemo.com.au/-/media/files/initiatives/der/2021/capstone-report.pdfBF184AC51804652E268B3117EC12327A

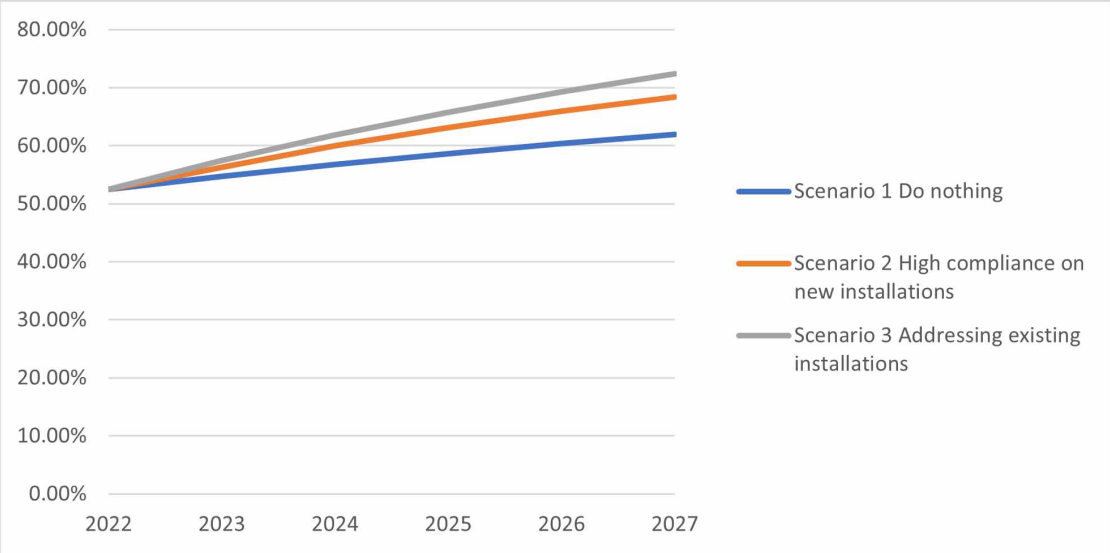
1. **Scenario one — no intervention**: Through the natural growth in compliant installations and replacements of existing plants, the total AS 4777.2:2020 compliance rate would be expected to increase marginally by the end of 2027 if no action is taken to improve compliance. The total number of non-compliant installations will continue to rise but will flatten out by the end of the decade due to the natural replacement of older stock.
2. **Scenario two — high compliance for new installations**: If only the short-term recommendations for new installations are successfully implemented, the compliance rate at the point of installation is expected to increase markedly. However, existing installations and baseline fault ride-through compliance are unaffected (see Scenario 3 Addressing existing installations).
3. **Scenario three — address existing installations**: If the short-term recommendations for post-installation rectification works and reconfiguration of existing installations (e.g., via remote firmware updates for supported devices) are also implemented, the mean compliance rate will increase slightly more than Scenario 2 High compliance on new installations.

Figure B.2: AS 4777.2:2020 solar PV inverters compliance rate (as a percentage of total fleet)



Source: AEMC.

Figure B.3: Fault ride-through solar PV inverters compliance rate (as a percentage of total fleet)



Source: AEMC.

B.1.2 Model results support final recommendations

Scenario one – no intervention

The percentage of the total solar PV inverter fleet that will be compliant with AS4777.2:2020 will remain very low until the end of the decade if no corrective action is taken to address CER technical standard compliance. New and replacement installations (assuming they are corrected installed) would only make incremental improvement to overall compliance because a large proportion of the total solar PV fleet was installed prior to AS4777.2:2020 was introduced as a minimum CER technical standard. Non-compliance with fault ride-through will likely increase if there is no intervention over the next five years, worsening system and operational risk: more solar PV inverters will shake off during and following a disturbance.

Scenario two – high compliance of new installations

Measures that support A high level of compliance on new installations would have a significant impact on boosting overall fleet compliance. The overall rate of fleet compliance is likely to peak by the middle of the decade, with the total number of non-compliant AS 4777.2:2020 installations starting to decline before 2030.

The total number of non-compliant fault ride-through installations is expected to decrease gradually with higher compliance for new installations. This provides some assurance that the problem of solar PV inverter shake-off will not be worse than it is today.

Scenario three – address existing installations

Modelling results show that measures that bring existing installations into compliance with AS4777.2:2020 (e.g. retrofitting) is likely to lead to the lowest number of non-compliant installations over all the years modelled. Retrofitting existing installations could also improve the fault ride-through performance, setting a high baseline level of compliance (see figure above).

Overall observations

The modelling results clearly show that fleet-wide compliance with AS477.2:2020 will not improve significantly where no proactive actions are taken to ensure CER devices are compliant with technical standards. While ensuring new installations are compliant CER technical standards will improve overall compliance, a combination of measures that address both new and existing installations are required to achieve a significantly improved outcome.

C APPLICATION OF THE NATIONAL ENERGY OBJECTIVES

The Commission has developed recommendations based on the following scope of this review:

- 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.[134]

In conducting reviews, the Commission must have regard to relevant energy objectives.[135] As such, the Commission has considered the extent to which draft recommendations would contribute to the achievement of the national electricity objective (NEO):[136]

> 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 recommendations would contribute to the achievement of the national energy retail objective (NERO).[137] The NERO is:[138]

> 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.

In developing these final recommendations, the Commission had regard to the NEO and NERO, as set out above.

In May 2023, Energy Ministers approved amendments to the national energy laws to implement their previous decision to incorporate an emissions reduction component into the NEO, National Gas Objective and the NERO.[139] The amendments were passed by the South Australian Parliament on 12 September 2023 and will come into effect on assent by the South Australian Governor.[140]

The Commission considers these recommendations will remain appropriate in light of the revised NEO and NERO. This is because the recommendations will, if implemented, support decarbonisation of the NEM by allowing for additional uptake of zero or low emissions CER.[141]

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

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

136 Section 7 of the NEL.

137 Section 236(1) of the NERL.

138 Section 13 of the NERL.

139 Department of Climate Change, Energy and Environment and Water, Energy and climate change ministerial council meeting communique, 19 May 2023.

140 *The Statutes Amendment (National Energy Laws) (Emissions Reduction Objectives) Act 2023.*

141 For more, see section 3.3.

C.1 Assessment framework

The Commission did not change the assessment framework between the draft and final report. The assessment framework is set out below.

Consumer outcomes

- Will compliance with technical standards promote DNSPs' ability to connect optimal CER capacity?
- 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 Commission 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?