Review of governance of Distributed Energy Resource (DER) technical standards

Energy Security Board

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Executive summary

Introduction

This review of governance of distributed energy resources (DER) technical standards is part of the Energy Security Board's (ESB) response to the Council of Australian Governments (COAG) Energy Council's request for advice on priorities for reform by the end of March 2020. Through this project, ESB is seeking to understand ways to improve the governance of DER technical standards to optimise the benefits of DER for all Australians and the National Electricity Objective (NEO)–in other words, efficient and effective outcomes for all energy system users.

This review uses the definition of DER in the ESB DER Integration Workplan that DER are 'resources located on the distribution system that generate, manage demand, or manage the network.'[1] This review is focused on technical standards for DER, that is, both hardware and data and communications standards across all forms of DER. The standards of interest are ones that address system security risks and opportunities, network operational risks and opportunities, and the optimising of DER services to deliver maximum benefits to all electricity system users. The governance of standards that are primarily focused on non-technical matters (such as consumer protections) are not in scope.

Why DER technical standards and their governance matter?

Across Australia, there is currently unprecedented investment in DER systems, especially rooftop photovoltaics (PV) and battery storage. For example, in 2019 small scale rooftop solar installations passed the 10 gigawatts total capacity milestone. Over the course of 2020, it is anticipated another 350,000 rooftop installations will add around 3 gigawatts.

At the system level, there is emerging concern from Australian Energy Market Operator (AEMO) that aggregated DER behaviour can affect outcomes during power system disturbances. For example, the sudden loss of large quantities of DER generation is detrimental for system security and to address this might require costly interventions and conservative management of the power system operation with associated additional costs.[2]

DER is also a challenge and an opportunity for the operation of distribution networks. In some cases, existing voltage issues are impacting and being enhanced by rooftop solar PV export, for example. DER may also impact thermal constraints in some parts of some distribution networks.

These types of system security and network management challenges are likely to result in suboptimal outcomes for consumers both with and without DER. For example:

- Consumers seeking to install DER may be subject to export limits or zero export conditions by distribution businesses in order to mitigate network risks

1 ESB, DER Integration Workplan, October 2019

2 See AEMO, Technical Integration of DER, April 2019

- Existing consumers who have invested in rooftop solar PV or other small-scale generation and/or storage may be constrained in their ability to export, impacting the return they were expecting to receive from their investment
- In future, networks may increase their proposed expenditure to manage voltage and thermal constraints which could lead to price rises for all customers (where this spending is approved by the Regulator). However, this is not a significant issue at present
- The contribution that DER systems provide to reduce the cost and emission intensity of the energy system may be diminished.

DER technical standards should mitigate these risks by providing for a minimum level of predictable performance (passive DER response) under network constraints or during power system disturbances.

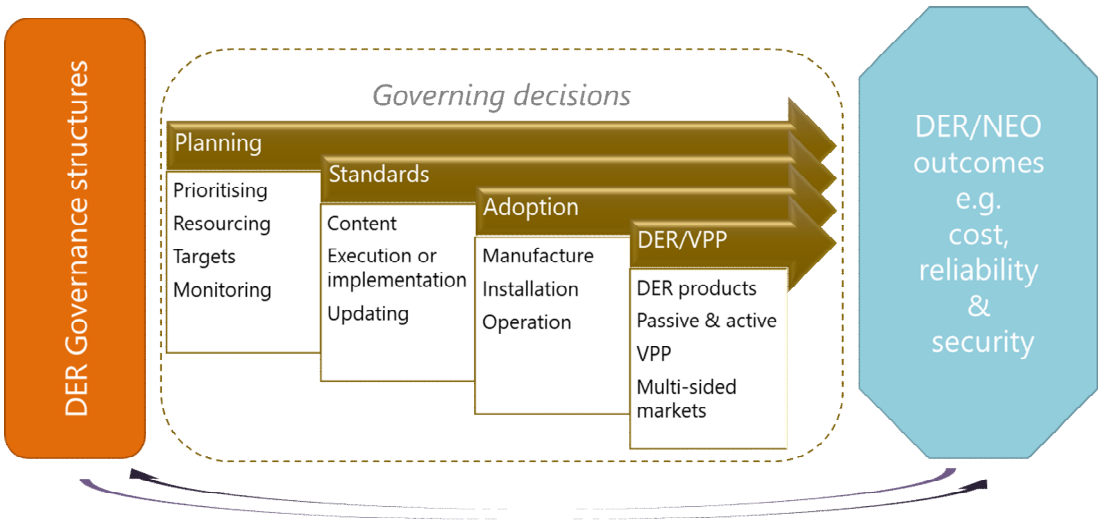
In addition, there are existing and emerging markets via which DER-owning consumers (prosumers) can access additional revenue by exporting and/or reducing demand at critical times (active DER response). These markets include ancillary service markets, wholesale energy markets and demand response markets. There will be increasing opportunities for prosumers to access benefits as technology and the markets themselves evolve. A critical mass of DER, under active control, may avoid the cost of dispatching or investing in utility scale generation or energy storage to provide system security services (e.g. frequency control reserves, voltage control).

DER technical standards, in particular communication, data, cybersecurity, and demand response standards, are necessary for the effective, efficient and secure operation of these markets. As discussed below, governance of DER technical standards is necessary to support effective DER standards development, implementation and compliance and enforcement.

Governance of DER technical standards and outcomes

The linkages between the design of DER technical standards governance system, and the potential contribution of DER to the achievement of the NEO, are illustrated in Figure 1 below.

Figure 1 Delivery of DER outcomes by DER governance systems



The scope of the project presented in this report is the entire intermediate chain of governing actions from the planning of the development of DER technical standards governance through to the delivery of DER goods and services (shown in Figure 1). This includes performance monitoring and compliance arrangements to ensure technical standards are being adopted and applied to the required performance metrics.

The focus of this report is assessing whether the DER governance structures (the content of the orange rectangle to the left) are capable of ensuring that governing actions (the four arrows in the middle) can be reasonably expected to deliver DER outcomes consistent with advancing: the NEO (the blue shape on the right); COAG Energy Council objectives for affordable energy and satisfied consumers; and the ESB's DER integration objective[3]. The report therefore seeks to identify any shortcomings in governing decisions and actions, on DER technical standards, that are attributable to the design of the DER technical standards governance system (the entire space depicted for each DER domain).

The assessment is concerned with the extent the achievement of the desired outcomes is constrained or put at risk by limitations or shortcomings in the current DER technical standards governance system. Addressing each individual DER governing decision and action is a matter for the relevant governing entities and is for the most part outside the scope of this report. In the course of identifying problems with the DER technical standards governance system, we have identified opportunities for 'quick wins' to improve DER technical standards governing (decision-making). These early actions could be undertaken in parallel with any steps to change or reform the DER technical standards governance system.

Public policy objectives

The framework for identifying public policy objectives follows the six metrics identified in the ESB's Strategic Energy Plan[4] and used in the ESB's Health of the Electricity Market report[5], with adaptations for DER technical standards governance. It is summarised in Table 1 below.

Table 1 Proposed DER technical standards policy objectives

Strategic Energy Plan objective (performance metric)	Proposed DER technical standards policy objectives
Affordable energy and satisfied customers	Outcomes that contribute to lower energy costs and customer satisfaction, whether customers are participating directly in DER markets or not, including by avoiding the cost of dispatching or investing in utility scale generation or storage, where such dispatch of investment would be less efficient than use or investment in DER products and services.
Secure electricity system	Outcomes that support deployment of visible, flexible, DER installations able to provide essential system security services.

3 See COAG Energy Council, Strategic Energy Plan, November 2019 , and ESB, *DER Integration Workplan*, October 2019

4 See Energy Security Board, *Strategic Energy Plan*

5 See Energy Security Board, *Health of the NEM*, February 2020

Reliable and low emissions electricity supply	Outcomes that support reliable and low emissions supply, including by avoiding the cost of higher marginal cost, higher emissions generation (compared with DER), to remain within the National Electricity Market (NEM) reliability standard.
Effective development of open and competitive markets	Outcomes that support the development of competitive markets for DER products and services, thereby enabling a higher rate of efficient uptake of DER installations than otherwise.
Efficient and timely investment in networks	Outcomes that avoid investment in networks – or reduce the costs of delay in network investments - where DER installations may be able to offer visible, secure and reliable substitutes for regulated network services, yielding lower network costs over time and contributing to the affordability, security and reliability objectives above.
Strong but agile governance	A DER technical standards governance system in place that is capable of adaptive regulation for the timely delivery of the outcomes above. Performance targets are set for all entities governing development and implementation of DER technical standards, and their adoption in multi-sided markets, alongside appropriate monitoring and compliance, enabling early detection and remedies for any emerging integration or performance problems that could jeopardise achievement of the outcomes above.

Approach

The overall approach of this review has been aligned with the *ex-ante* policy evaluation of a Regulatory Impact Statement (RIS). This is a first, scoping stage or consultation RIS, and does not constitute a COAG RIS and no cost benefit analysis has been undertaken[6].

This approach requires articulating the case for action via a statement of policy objectives and problem definition. It also requires identification of policy options and making an (in this case initial) assessment of those options. The proposed option should be effective and proportional to the issue being addressed.

Method and evidence

The schedule available for this project limited evidence gathering. Nevertheless, information gathering included:

- Consultation with a total of 61 stakeholder organisations and discussion of findings with 61 organisations
- A survey to enable broad engagement with a wider set of stakeholders. The survey was administered through SurveyMonkey. This enabled targeted messages to be sent to prompt respondent to complete the survey in the time available.

6 See Office of Best Practice Regulation Guidance: *Best Practice Regulation: A guide for ministerial councils and national standard setting bodies* (October 2007). This provides guidance to Council of Australian Governments (COAG) Ministerial Councils and other national standard setting bodies on best-practice regulation making.

Consequently, the Review received at least one response from 43 stakeholder organisations (81% response)

- Targeted discussions with more than 30 stakeholders, seeking deeper and detailed views, including identifying 'quick wins'
- A desktop examination of existing DER technical standards governance arrangements together with comparisons with other jurisdictions and technologies
- A webinar presenting a summary of the review findings to stakeholders[7].

Current state of DER technical governance

There are many ways to implement the action of governing into an agreed set of structures and processes – for this the term "governance arrangement" is used in this report. In Figure 2 a generic governance arrangement as an inverted triangle illustrates the purpose originating in a source of authority (such as a constitution for an organisation or legislation for a public sector agency) establishing structures and processes for a governance entity to make decisions implemented by a coordinating entity to produce goods and services to users that meet the purpose originating in a source of authority. Some sort of monitoring provides feedback to confirm the purpose is being met.

Figure 2 Schema for a governance arrangement

Currently there are a range of arrangements in place which govern the way DER technical standards are developed, maintained, complied with and enforced in Australia, as set out in Table 2 below.

Table 2: Governance arrangements in currently place for DER technical standards

Governance arrangements	Current examples
Arrangement 1 – Australian and international standards	Various Australian and international standards, e.g. AS 4777 for network-connected inverters. These standards are voluntary until invoked in legislation or regulation, or by contract (such as connection agreements).

[7] One of the themes through the process of this review and looking forwards to improvements is the uncertainty in the stakeholders in existing governance processes, and concomitant contact details. The Review stakeholder list grew throughout the review from an initial list based on ESB historic DER activities , including nine more organisations invited to the webinar than invited to the survey.

Arrangement 2 – Infrastructure provider (DNSP) requirements	Distribution Network Service Provider (DNSP) connection agreements (contracts) for customer connection to the grid.
Arrangement 3 – State based incentive/rebate schemes	Various incentive, rebate and low interest loan programs supporting DER deployment, which include technical standards as contractual conditions for incentives, for example: • Victorian Solar Homes Program • South Australian Battery Scheme • Queensland Interest Free Loans for Solar and Storage • New South Wales Empowering Homes Program • ACT Next Generation Storage Program • ACT Solar for Low Income Households Program
Arrangement 4 – Commonwealth incentive/rebate schemes	Small Scale Renewable Energy Scheme, includes technical standards (e.g. AS 4777 for network connected inverters for solar PV installations) for Small-scale Technology Certificates (STCs) certification.
Arrangement 5 – State based legislated requirements	State based electrical safety requirements for installations cite a large range of Australian Standards
Arrangement 6 – Commonwealth based legislated requirements	Greenhouse and Energy Minimum Standards (GEMS) is a national framework for product energy efficiency and efficiency labelling in Australia.
Arrangement 7 – Requirements for market participation	Virtual Power Plants (VPP) that aggregate and control DER are required to satisfy technical requirements to participate in the wholesale market.

Findings

The current lack of coordination, planning, and resourcing, and slow pace of decision making within the various governance arrangements for DER technical standards in place across Australia, together mean that DER systems deployed today are unlikely to be able to deliver the performance levels and service levels required. As DER uptake continues to accelerate in Australia, there is an urgent need to reform governance of technical standards to ensure that all new systems installed can meet the required technical performance levels, both now and even more so in the future.

All the governance arrangements described above have gaps and weaknesses when assessed individually. Furthermore, when considered in aggregate, the individual governance models, rather than being complementary:

- Give rise to coordination and harmonisation issues.

- Have gaps in terms of coverage of technologies and technical risk.
- Have gaps in terms of adequate resourcing.
- In some cases, deliver inefficiencies where multiple entities have responsibility for ensuring compliance with technical standards for the same DER systems.

The most critical gaps and weaknesses are:

- An overall lack of leadership and coordination and clear objective as to how DER technical standards should be governed, particularly in a divided and distributed regulatory environment[8]
- The lack of an adaptive regulation system where the good (enough for now) is not blocked by the perfect, and practical and enacted standards evolve at a pace similar to technology and industry
- Inability to implement technical standards related to emerging system security challenges - none of the governance models (other than voluntary Australian and International Standards) currently enable AEMO to impose technical standards for managing system security risks
- The Standards Australia process which, in some stakeholders' view is too slow, not sufficiently transparent, does not enable participation from a broad range of stakeholder groups (especially customer groups) and decision making is not explicitly aligned with NEO
- Lack of harmonisation in network connection standards across DNSPs in terms of both decision-making processes and the technical standards themselves
- The lack of planning in terms of how the broadly successful processes adopted by the Clean Energy Council (CEC) and Clean Energy Regulatory (CER) under the Small Scale Renewable Energy Scheme (SRES) will transition as the SRES is wound down
- Under resourcing of compliance and enforcement activities, and gaps especially for non-safety related standards in a divided and distributed regulatory environment
- Lack of coverage of existing governance models to electric vehicle technology, potentially leaving the industry exposed to technical risks at network and system level, should penetration increase rapidly.

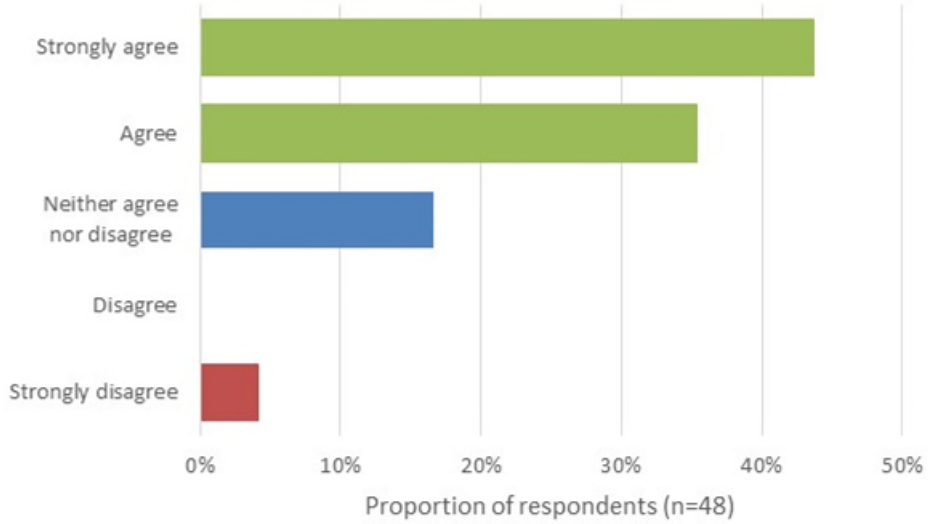
There is strong stakeholder support for government leadership and action

The survey's final question tested the appetite for change. Figure 3 shows the survey results – 79 percent of respondents agree or strongly agree that there is a case for change.

8 The whole regulatory system across all Australian Commonwealth, State and Territory jurisdictions includes somewhere between 16 and 40 Acts as well as their subsidiary regulations.

Figure 3 A case for action– survey response

Do you consider there is a case for changing the governance of DER technical standards to align with the needs of the current and future DER product and energy services markets?



The case for substantial and urgent governance reform toward adaptive regulation

In the absence of reform of the DER technical standards governance system, outcomes will not be consistent with the public policy objectives (and by implication the NEO). There is a much higher risk of a no-win outcome, under which there is substantial consumer investment in DER installations and appliances, alongside substantial utility investment in replacement of exiting generation, storage and network capacity, resulting in widespread inefficient duplication of overall capacity and much higher total electricity supply costs. This would reduce overall affordability and consumer satisfaction.

This possible outcome reflects the weakness or absence of any drivers under the current governance system for governing decisions on the development and adoption of DER technical standards at the rate necessary to anticipate rapid future technology and market change, as existing generation exits and is replaced by new forms of generation and storage, and associated network augmentation. Accordingly, there is a strong case for energy market institutions and government action to ensure proposed public policy objectives for governance of DER technical standards are achieved.

In the absence of change, the electricity system would have reduced resilience and an increased exposure to risks from potential market shocks, including as a result of:

- Any decline in reliability of existing generation, especially in the context of more frequent and severe extreme weather and bushfires
- The exit of existing thermal generation earlier than currently projected (not forecast) in the draft 2020 Integrated System Plan[9] (ISP), with limited opportunity to address any shortfall under a two-year notice period

[9] AEMO, Draft 2020 Integrated System Plan, December 2019, available from https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/ISP/2019/Draft-2020-Integrated-System-Plan.pdf

- Any material delays in completion of the large-scale network augmentation necessary to support further investment in utility scale generation and storage, including any delays in the energisation of transmission for the Snowy 2.0 project
- Limits on the ability of distribution networks to manage increasing penetrations of DER installations.

Insights from other jurisdictions and sectors

Other jurisdictions and sectors provide insights that can be used to inform the development of DER technical standards governance models in Australia. Learnings can be categorised into the following areas:

- Implementation of a dedicated, industry specific, standards body
- Models for standards decision making in a context of rapid technological change.

A dedicated standards body can be effective in achieving the level of consistency and regulation across the power sector that is needed for DER technical standards.

It seems likely that some DER-related data sets (notably the DER Register) may be captured by the Consumer Data Right-Energy. The Australian Data Standards Body model for developing standards could potentially be expanded to data and data security aspects of DER. This would ensure national consistency in technical standards for data and data security, alongside integration with the Consumer Data Right-Energy. For example, it is likely to apply to DER consumer data held by AEMO and the Clean Energy Regulator (including in relation to SRES).

In regions like Germany and North America, standardisation for electrical, electronic and information technologies technical standards is regulated through a single standards body. A standards body that collaborates across the various industry stakeholders and bodies can deliver industry wide consensus on DER technical standards.

In Germany the standards body, German Commission for Electrical, Electronic & Information Technologies (DKE), is a national non-profit based organisation; the standards it produces are able to be mandated through contracts, laws or regulations.

The telecommunications sector in Australia is also an example of the creation of an industry specific standards body. All technical standards for the wired and wireless communications and media infrastructure and services under the telecommunications sector in Australia is governed by the Australian Communications and Media Authority (ACMA) under Commonwealth legislation.

Under the Telecommunications Act, ACMA may require an industry body to develop a code or standard that is added to the register or it imposes its own standards. The Communications Alliance is a coregulatory institution with accredited as a Standards Development Organisation for Standards Australia. Thereafter, ACMA monitors the industry to ensure compliance to licence conditions, codes and standards, and to ensure regulations are responding to the needs of the community.

In 2010 the Hawaiian Public Utilities Commission (HPUC) established a working group to respond to the rapid changes required in technical standards (related to DER and large-scale renewables) to achieve Hawaii's 100% clean energy by 2045 target. The working group established strict decision-making processes in order to fast track decision making.

It is noteworthy in each example that either there is a single regulatory jurisdiction or there is a longstanding history of inter-jurisdictional harmonisation.

Short term actions or 'quick wins'

A number of early actions have been identified from consultation with stakeholders that may be able to be progressed within the existing DER technical standards governance system. Note that while some of these actions have been discussed with agencies nominated to lead, no agreements have been reached or commitments made. The ESB will need to undertake further engagement with relevant stakeholders to refine and implement these proposed actions.

1. **Expedited Australian Technical Specification, led by the Distributed Energy Integration Program (DEIP) Standards, Data and Interoperability Working Group**: For example, for an urgent aspect of AS 4777, AEMO would apply the existing Standards Australia streamlined process to produce an Australian Technical Specification (ATS) within a production schedule of about 12 months. Proposed in the same manner as an Australian Standard, an Australian Technical Specification can be employed quickly to formalise the output of less formal development processes, most likely involving the AEMO/CEC/CER and the DER Integration API Technical Working Group.[10]
2. **AER/Energy Networks Australia (ENA)/CEC negotiate to host a central information resource encompassing all current DNSP connection standards including regular updates**: This could involve AER working closely with ENA to coordinate processes for regular sharing of DNSP information via the AER.
3. **National DER stakeholder database:** The ESB DER Steering Committee would oversee the construction of a single coordinating individual and organisational contact database, organised by DER technology, standard, topic, existing standards groups. Access would be provided to recognised bodies/processes, with wider access by category invitation.[11] This would enable stakeholders to understand the scope of work being conducted on technical standards of DER technologies, and maintain communications with the groups of stakeholders that have an interest in those technical standards. This may be compared, for example, with the contact databases for Food Standards managed by FSANZ that allow the national regulatory to maintain contacts with stakeholders in different standards in the Food Code.

Options identified

Table 3 below sets out a set of options from short term through to far reaching structural reform.

Table 3: Options for the future governance of DER technical standards

Option	Description
Option 1 No change	Implement short-term actions identified, only.

[10] Standards Development – SG-003: Standards and other publications, available from https://www.standards.org.au/standardisation-guides

[11] That is inviting all contacts identified by categories/DER technologies/standards to be invited to engage in a new initiative.

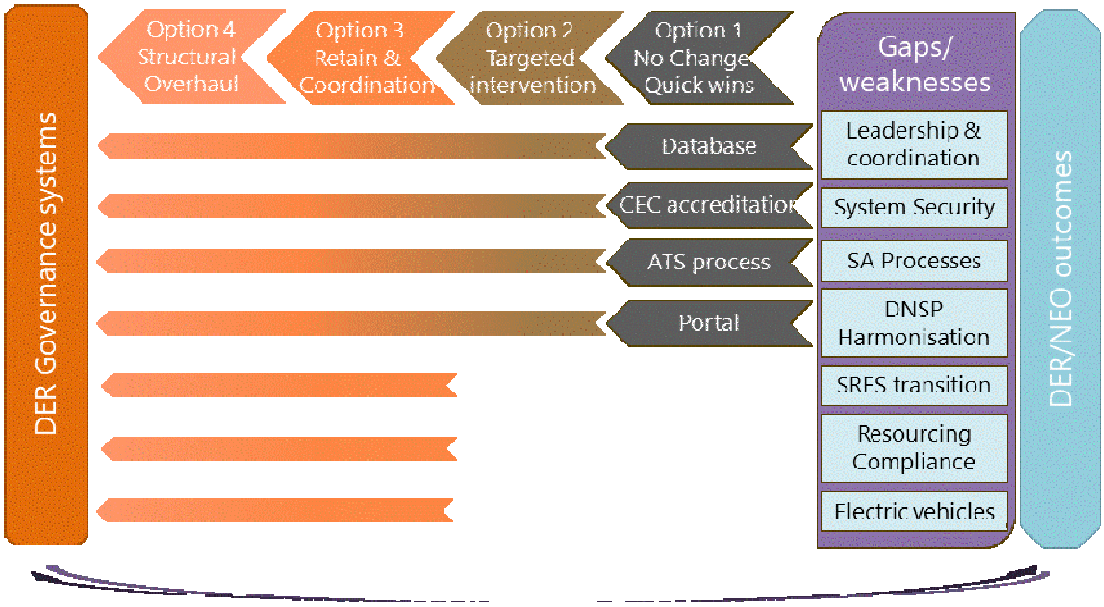
Option	Description
Option 2 Targeted governing interventions	No change to DER standards governance system, short term actions under Option 1 supported by targeted interventions, including a Statement of Policy Principles to facilitate early rule changes, and additional resources for Standards Australia DER technical standards development.
Option 3 Governance reform – improved governance system coordination	Create a new DER standards governance coordinating structure, with a statutory head of power, to provide clear leadership, and line of sight between a DER governance vision and continuing distributed governing of DER technical standards, supported by a new performance monitoring framework, along with improved monitoring, and compliance arrangements to allow earlier detection and remedies for non-compliance.
Option 4 Large scale Governance reform – Overhaul of governance of DER technical standards	As for Option 3, with far reaching reform of DER technical standards governance, including by centralising DER technical governance decisions into a new national framework, seeking to achieve faster change and DER integration.

Options assessment

The diagram below in Figure 4 adds an assessment loop to the linkages in Figure 1 between the DER governance systems and DER/NEO outcomes, indicating the scope of each option to address identified gaps and weaknesses in the governance of DER technical standards that are obstacles to achieving desired DER/NEO outcomes.

Option 1 makes incremental improvements to the status quo, but does not address the lack of leadership, coordination and the challenges of institutional and cultural roadblocks. As noted in the summary of findings, Option 1 is not considered capable of delivering outcomes that are consistent with the proposed public policy objectives, or with most stakeholder views. There are some 'quick wins' for some of the identified weaknesses, but not others. In particular, there are no quick wins with respect to a) verification and enforcement of installation compliance, as this requires coordination across regulatory and jurisdictional divisions, and b) building and transport electrification (e.g. heat pumps and electric vehicles), as this requires coordination with building and transport standards.

Figure 4 Assessment of options against gaps in achieving DER/NEO outcomes



Option 2 is also not considered capable of delivering outcomes consistent with the proposed public policy objectives, or with most stakeholder views. There may be some targeted actions that address some of the shortcomings of current technical DER standards arrangements, so Option 2 is superior to Option 1.

Option 3 tackles key weaknesses in the current DER technical standards governance system. It provides leadership and coordination while retaining the distributed nature of the existing DER technical standards governance system. Within an overall Roadmap for adaptive regulation in DER technical standards, Option 3 can pursue the quick wins and targeted interventions that deliver short term improvements, while the structure itself is designed and implemented. This provides both the coordination to advance priority technical standards, whilst also developing a roadmap for designing changes to the DER technical standards governance system itself.

There is nevertheless a significant risk that Option 3 does not go far enough to ensure realisation of potential DER benefits and the achievement of the NEO. This is because it does not directly change the piecemeal or siloed governance under the current DER technical standards governance system.

Option 4 envisages a major reform where governance of DER technical standards is centralised under a single national system allowing more substantial change. This directly addresses the current piecemeal or siloed culture by bringing all responsibilities under the aegis of a single authority. This is a relatively common arrangement in comparable industries and jurisdictions, including the new national data standards setting arrangements under the Consumer Data Right (CDR).

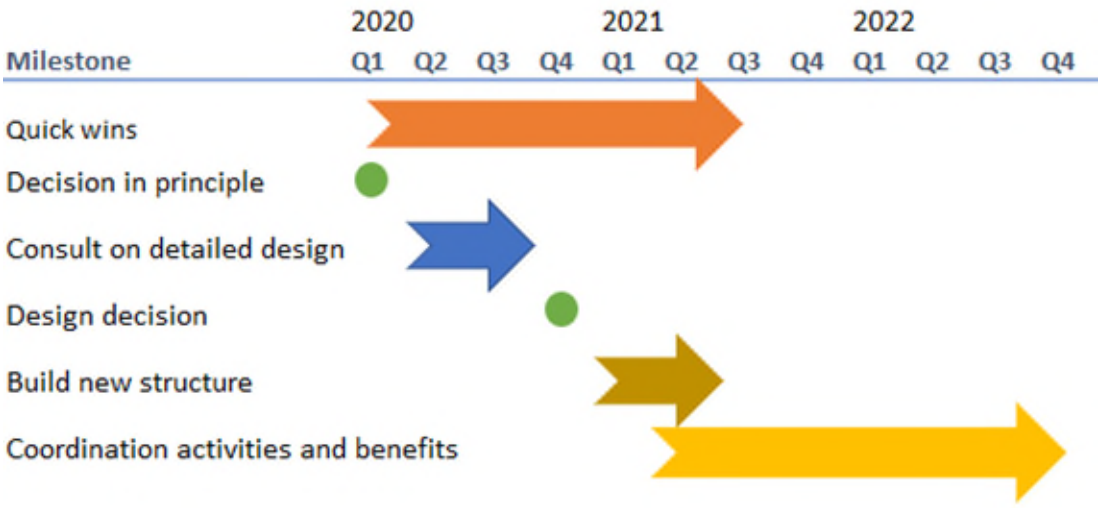
The design and implementation of Option 4 requires regulatory reforms of a sector that is heterogeneous, and which has not made significant steps towards harmonisation to date. The scale and scope of such reforms introduce significant risks and possible delay to necessary decisions to change the governance system, arising from the change process itself. Furthermore, in the context of the timeframe for this review, the immediate choice is whether to instigate a reform process for the system of governance of DER technical standards.

On balance, the preferred option available for governance reform is Option 3. As described below in the Roadmap section below, there is a design stage to develop stakeholder agreement with the proposed reform design and the outcome could be a variation on Option 3, as described here, or an evolution toward Option 4.

Roadmap/next steps

This section sets out a roadmap for the implementation of options 1-4. Figure 5 describes a timeline where the 'quick wins' under option 1, and targeted interventions under Option 2, are pursued immediately. It is proposed the new governance system under Option 3 is up and running from the middle of 2021. After that, the new governance structure is able to determine performance targets for DER governing and to begin its monitoring activities, and where necessary, interventions.

Figure 5 Timelines for development of coordinating structure (option 3)



Under the proposed roadmap, the first decision is required at the March 2020 COAG Energy Council meeting, whether to endorse in-principle detailed exploration and design of the options proposed in this report. This allows around six months for the detailed design and another 6 months to establish the new governance structure. From the second quarter of 2021, the new structure is undertaking coordination activities and delivering benefits. It also assumes responsibility for any ongoing tasks from 'quick wins'.

Key issues to be resolved in the design stage include the following:

- The functions and objectives of the governance structure and the vision for its evolution (e.g. is Option 3 an end state or a milestone toward some form of Option 4)
- Legal architecture (e.g. State or Commonwealth based, or combination)
- Participation and allocation of decision rights between participants (in statute, recognising that consumers collectively are the major funders of DER markets and have a vital interest in maximising the benefits from better DER technical standards integration, while at the same time ensuring decision rights are also allocated to DNSPs, AEMO and DER market participants

- Process for decision making (set out in Statute) – e.g. who can decide what and what do they have to do first?
- Resourcing implications and funding options for operating DER governance structure (budget bid and funding options) for operating the new governance structure, including the size and location of any secretariat role
- The extent DER technical data and data security standards processes should be integrated with Data Standards Australia.

A final decision on the design would be made at the scheduled COAG Energy Council meeting in October 2020. Following this, a period of up to nine months has been allowed to establish the new structure. This may include new legislation and associated resourcing.

There is scope to revisit or overturn the decision in principle before a final commitment is made to invest in the new Governance structure itself. The only sunk cost would be the resources uses to develop the detailed design. This sunk cost may be in the millions of dollars, while the costs of delay would be a multiple of this[12]. This suggests that approval of a decision in principle is consistent with the least regrets' principle.

12 The sunk costs of revising a March decision to implement a reform process are largely the salaries of government staff developing the project and stakeholders' time engaging with consultation, based on a benchmark value $200k pa per person. The costs of delay arise from many sources is two main classes, being deferred investment in lost cost generation and/or load reduction or demand response equipment, and the higher future system security costs from continuing reduced levels of technical compliance and the resultant uncertainty and conservative system management and associated market costs as well as possible (avoidable) event losses.

Glossary

ACMA	Australian Communications and Media Authority
ACCC	Australian Competition and Consumer
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ANP	German Committee of Standards Users
ARENA	Australian Renewable Energy Agency
AS/NZS	A jointly developed Australian and New Zealand Standard
Australian Technical Specification	A Technical Specification may be prepared in a field where the subject matter, or a related aspect such as the regulatory environment, is undergoing rapid change and where speed of delivery, rather than full consensus, is of paramount importance
BAU	Business As Usual
CDR	Consumer Data Right
CEC	Clean Energy Council
CER	Clean Energy Regulator
COAG	Council of Australian Governments
DER markets	Product markets for equipment and installation of DER at an owner's site
DER services markets	Proposed energy markets for energy services provided by DER
DIN	German Institute for Standardisation
DKE	German Commission for Electrical, Electronic & Information Technologies
DNSP	Distribution network service provider
DNSP technical connection agreements	Document that sets out the connection offer and which contains (amongst other things) the safety and technical requirements to be complied with by the proponent as a contract
DNSP technical connection standards	Document produced by each DNSP setting out their requirements for proponents to enable a grid connection
DR	Demand response
DRSP	Demand response service provider

DSB	Data Standards Body (Consumer Data Right)
DSO	Distribution system operator
E3	Equipment Energy Efficiency (E3) program is a cross jurisdictional program to deliver a single, integrated program on energy efficiency standards and energy labelling for equipment and appliances
EEAT	Energy Efficiency Advisory Team is a part of COAG Energy Council, and manages the E3 Program
ENA	Energy Networks Australia
Energy safety regulator	In Australia, safety electrical regulatory functions are largely the responsibility of state and territory governments.
ERAC	Electrical Regulatory Authorities Council is an organisation coordinating the activities of Australian and New Zealand electrical regulators
ERO	Electric Reliability Organisation
ESOO	Electricity Statement of Opportunities
EV	Electric vehicle
FCAS	Frequency Control Ancillary Services
FERC	Federal Energy Regulatory Commission
GEMS	Greenhouse and Energy Minimum Standards Act 2012
Governance	Governance is an ambiguous term - in this review, governance refers to the processes and structure for making collective decisions about a) the development of new DER technical standards and maintenance/ updating of existing technical standards: and b) verifying compliance with and the enforcement of compliance with DER technical standards
Governance arrangements	The term "governance arrangement" is used in this report to refer to the way the action of governing is implemented through an agreed arrangement of structures and processes - see discussion around Figure 6. This usually includes enabling statutes establishing structures and processes for a governance entity to make decisions implemented by a coordinating entity to produce goods and services to users that meet the purpose originating in a source of authority
Governance processes	Typical governance processes include meetings, meeting agenda (prioritisation), information & decision papers, decision making, minutes, communications (implementation of decisions) and governance evaluations

Governance structures	Typical governance structures include a constitution defining membership, decision making authority, responsibilities (stakeholder accountability), processes and resources, a Board and Chair and supporting secretariat
HPUC	Hawaiian Public Utilities Commission
IEEE	Institute of Electrical & Electronic Engineers
IEC	International Electrotechnical Commission
ISO	International Organisation for Standardisation
JAS-ANZ	Joint Accreditation System of Australia and New Zealand
NATA	National Association of Testing Authorities
NEM	National Electricity Market
NEO	National Electricity Objective
NER	National Electricity Rules
NERC	North American Electric Reliability Corporation
OAIC	Office of the Australian Information Commissioner
PV	Photovoltaics
RET	Renewable Energy Target
RIS	Regulation Impact Statement
RSWG	Reliability Standards Working Group
SAPS	Stand-alone power system
SCO	Senior Committee of Officials (SCO) is in place to advise the COAG Energy Council and develop issues for its consideration in the context of the Council's Terms of Reference and other issues as identified and agreed by Ministers.
SRES	Small-scale Renewable Energy Scheme
STCs	Small-scale Technology Certificates under the Small-scale Renewable Energy Scheme, representing 1 MWh of eligible renewable electricity either generated or displaced by small-scale renewable energy system.
Technical specifications	Technical standards for DER, that is both hardware and data and communications standards across all forms of DER.
V2G	Vehicle to grid technology
VDE	Association for Electrical, Electronic and Information Technologies
VPP	Virtual power plant

1. Introduction

1.1 Project overview

This review of the governance of DER technical standards is part of the ESB's response to the COAG Energy Council's request for advice on priorities for reform by the end of March 2020.

The ESB is seeking to understand ways to improve the governance of DER technical standards to optimise the benefits of DER for all Australians and the NEO – in other words, efficient and effective outcomes for all energy system users.

The ESB recognises the need for the process of developing and updating standards to be more efficient in order to speed up timely adoption of DER technical capabilities that can assist the energy system's reliability and security and to facilitate DER owners' access to current and future energy markets.

1.2 Definition of DER and technical standards

This review employs the definition of ESB DER Integration Workplan that DER are 'resources located on the distribution system that generate, manage demand, or manage the network.'[13] This is inclusive of, but not limited to:

- Generation: rooftop solar; solar hot water; small diesel; and other generators
- Load: smart appliances (e.g. air conditioning, pool pumps); energy efficiency; and building electrification (e.g. heat pumps)
- Generation and load: battery storage; electric vehicles and vehicle to grid services; energy management systems (e.g. microgrid controllers); and standalone power systems (SAPS).

The review is focused on technical standards for DER, that is both hardware and data and communications standards across all forms of DER. The standards of interest are ones that address system security risks, network risks and the optimising of DER services to deliver maximum benefits to all electricity consumers. The governance of standards that are primarily focused on non-technical matters (such as consumer protections) are not in scope.

What is meant by governance of DER technical standards?

DER technical standards consist of a suite of interlocking documents that set out dozens of technical, safety and performance standards for typical DER systems.[14] Governance of technical standards is broader than the standards themselves.

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13 ESB, *DER Integration Workplan*, October 2019

14 These include, for example, various voluntary Australian Standards mandated by different legal instruments, as well as network connection agreements and technical standards included in Stage legislation, incentive schemes and other mechanisms.

Major elements of the governance system include statutory foundation and the allocation of decision-making between institutions. It may also include any overall monitoring of performance of actions and decisions taken by governing entities. The governance system governs decisions (the act of governing) regarding the design, adoption, implementation, monitoring and compliance of DER technical standards.

The concept of governance and governing has multiple origins and meanings and the term can sometimes serve to obscure rather than clarify issues. What is meant by governance in this review, are the structure and processes for making collective decisions about:

- The development of new DER technical standards and maintenance/updating of existing technical standards
- Verifying and enforcing compliance with DER technical standards.

Standards governance includes the legal architecture to ensure outcomes conform with decisions made and compliance monitored.

What is meant by a governance arrangement?

The term "governance arrangement" is used in this report to describe the many ways to implement the action of governing into an agreed arrangement of structures and processes. A generic governance arrangement is illustrated in Figure 6 as an inverted triangle representing the purpose originating in a source of authority (such as a constitution for an organisation or legislation for a public sector agency), establishing structures and processes for a governance entity to make decisions implemented by a coordinating entity to produce goods and services to users that meet the purpose originating in a source of authority. Some sort of monitoring provides feedback to confirm the purpose is being met.

Figure 6 Generic governance arrangement

Typical governance structures include a constitution defining membership, decision making authority, responsibilities (stakeholder accountability), processes and resources, a Board and Chair and supporting secretariat, Board standing sub-committees for permanent tasks such as finance and audit and tasks forces for time limited tasks. Typical governance processes include meetings, meeting agenda (prioritisation), information and decision papers, decision making, minutes, communications (implementation of decisions) and governance evaluations.

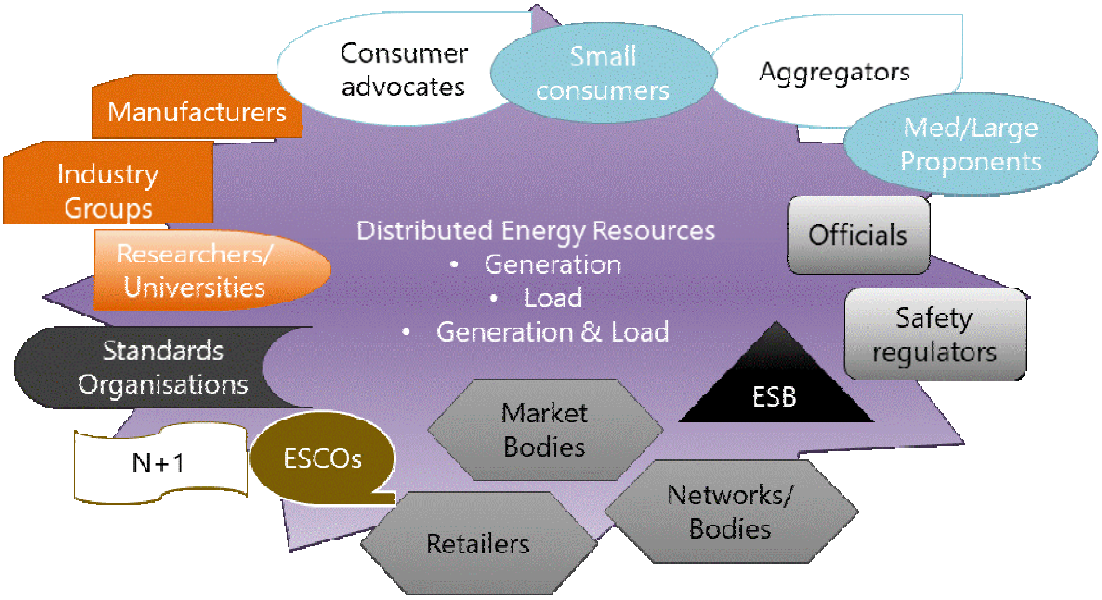
The inverted triangle in Figure 6 is used in the report to represent individual governance models operating in parallel for a specific DER technology (such as in Figure 17).

1.3 Approach, method and evidence

The overall approach has been aligned with the *ex-ante* policy evaluation of a RIS, although this is a first, scoping stage, and does not constitute a RIS and no cost benefit analysis has

been undertaken.[15] This approach requires articulating the case for action via a statement of policy objectives and problem definition. It also requires identification of policy options and making an (in this case initial) assessment of those options. The proposed option should be effective and proportional to the issue being addressed.

Figure 7 Stakeholder categories in the governance of DER Technical Standards



The project commenced in early January 2020 with the objective of supporting the ESB's recommendations to the COAG Energy Council meeting in March. Figure 7 provides a schematic of the stakeholder categories in the governance of technical standards for distributed resources. It is noted that the engagement processes itself highlighted the difficulties maintaining current contacts across interested stakeholders, particularly in diverse locations in government. Appendix 1 details the engagement with stakeholders.)

One of the difficulties through the process of this review and looking forwards to future development processes is the lack of knowledge regarding the stakeholders in existing governance processes, including key individuals and their contact details. The master list for consultation was assembled from a combination of ESB participant lists from prior DER consultation processes together with further additions by ESB, Sapere and CutlerMerz, for example adding electric vehicle industry stakeholders. The stakeholder list grew throughout the review, and even after consultation research a further nine more organisations were invited to the webinar presentation of findings than invited to participate in the data collection.

While Figure 7 identifies a wide range of known stakeholder categories the "N+1" stakeholder category, (using network reliability parlance) refers to those stakeholders that have not been identified yet.

The timeframe for the project limited evidence gathering, and this review is a rapid high-level review of the system of governance arrangement for governance of DER Technical Standards.

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15 See Office of Best Practice Regulation Guidance: *Best Practice Regulation: A guide for ministerial councils and national standard setting bodies* (October 2007). This provides guidance to Council of Australian Governments (COAG) Ministerial Councils and other national standard setting bodies on best-practice regulation making.

This review is not, for example, an evaluation of the 'board' of any one governance arrangement involving surveying and/or interviewing each board member (or a dozen evaluations of a dozen governing arrangements). Nevertheless, in addition to conducting a desktop examination of existing DER technical standards governance processes together with comparisons with other jurisdictions and technologies, this review involved consultation with a total of 53 stakeholder organisations through:

- An online survey to enable broad engagement with a wide set of stakeholders. At least one response from 43 (81%) of the stakeholder organisations was received. The quantitative survey results have been used to underpin a sector-wide view (rather than Sapere-CutlerMerz view) of the governance arrangements examined in the review. Quotes from the text survey questions and discussions have been used throughout the report in italicised paragraphs to "tell the story in their own words". Stakeholder views regarding specific governance arrangements have been summarised in the analysis of section 3
- Targeted structured discussions with more than 30 stakeholders, seeking deeper and detailed views on the strengths and weaknesses current arrangements for governance of DER technical standards and opportunities for improvements in the short, medium and long term
- A webinar presenting the review findings to stakeholders from 61 organisations.

Appendix 1 details the engagement with stakeholders through these processes.

The report is broadly structured in line with a standard RIS approach:

- Section 2 describes the context and proposed public policy objectives
- Section 3 sets out the current state of existing governance models
- Section 4 summarises the main outcomes and themes obtained from stakeholder consultation
- Section 5 provides a summary of similar systems for unified governance of technical standards that provide exemplars for possible future DER technical standards governance in Australia
- Section 6 sets out a problem definition, setting out the variance between the public policy objectives and likely outcomes in the absence of change
- Section 7 identifies and assesses potential options to address the problem definition and deliver the proposed public policy objectives. It also proposes a roadmap and next steps.

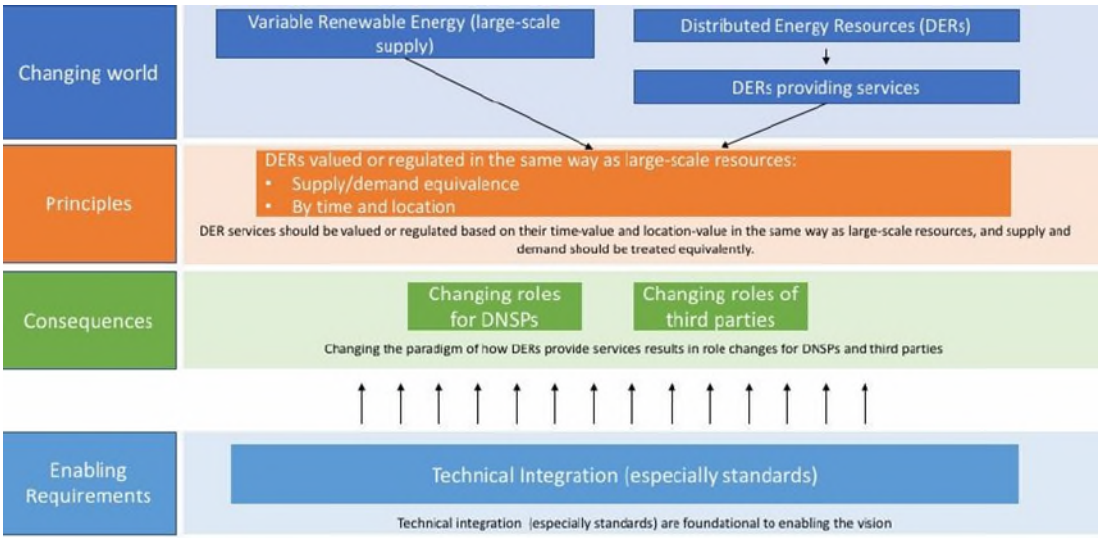
2. Context and proposed policy objectives

2.1 ESB DER integration vision

The ESB DER Integration Workplan overarching objective of DER integration is to 'optimise the benefits of DER investment for all Australians'.

> *Note that this objective does not distinguish between benefits of DER owners (such as those with air conditioning or solar panels) or other consumers. Rather, the objective is to optimise both public and private investment in DER for the benefit of the whole electricity system and everyone who uses it*[16].

Figure 8 ESB Vision for DER integration



2.2 Building DER platforms upon DER technical standards

DER product markets or domains support a range of DER related goods and services. These include business and household appliances; embedded generation such as rooftop photo-voltaic systems; energy storage; electric vehicles; and other goods and services. They also include the energy management systems that may be located on customer premises or which are managed offsite, but linked with customer premises via secure data sensing, control and transfer systems.

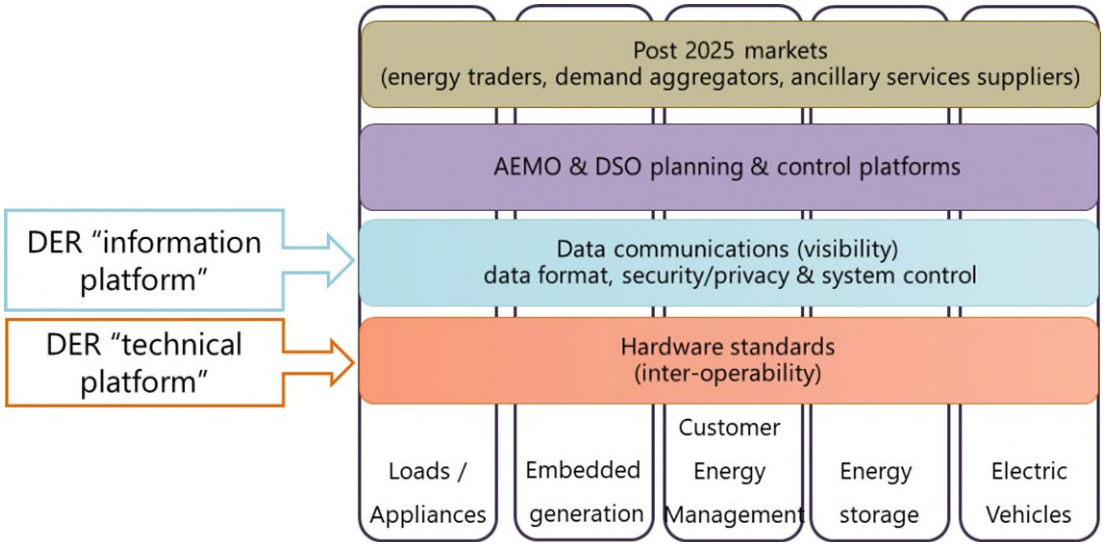
The term "platform" is used in the Information Communications Technology sector to refer to the hardware and communications systems that can operate across multiple technology

16 ESB, DER Integration Workplan, October 2019

systems and commercial operators. For example, in computing, web pages operate across multiple hardware and software operating systems, and multiple browser applications, spanning multiple and types of content by a myriad of publishers. The term "platform" is also used to refer to an integrated, interoperable system for trading in goods and services, with Amazon being a notable example.

A DER communications "platform" allows DER installations to interact both with other DER operating systems (e.g. across installation sites, equipment manufacturers, networks, energy suppliers and AEMO), and also with the wider power system (notably the system for dispatching generation to meet demand operated by AEMO). The scope of DER goods and services and associated technical platforms (technical and communications) is illustrated in Figure 9 below.

Figure 9 Scope of DER and technical and communications platforms



The focus of this report is the design of governance structures for decisions and actions (governing) on hardware standards (inter-operability) and data, communications (visibility), data format, security/privacy and DER system control. It is not concerned with the individual DER domains (bottom level) or the AEMO/distribution system operator (DSO) planning and control systems, or post-2025 markets (top two levels), other than for a group of identified accelerated governing actions.

The project focus is not limited to network-connected DER. The widespread and effective adoption and implementation of DER technical standards influence outcomes for the affordability, reliability and security of both the shared power system and SAPS.

The design of DER governance structures influences decisions regarding the planning, resourcing and priorities for the development and adoption of DER technical standards. This in turn influences the rate of development of technical standards and their subsequent adoption or recognition in voluntary or mandatory DER standards, for example via State legislation, industry codes, guidelines, or similar arrangements.

The adoption of technical standards in turn influences the design and capabilities of manufactured DER equipment and installed facilities that enable the supply of DER goods and services. Effective and appropriate DER connections and communications standards, and associated practices and protocols, form a platform for technical and market integration to

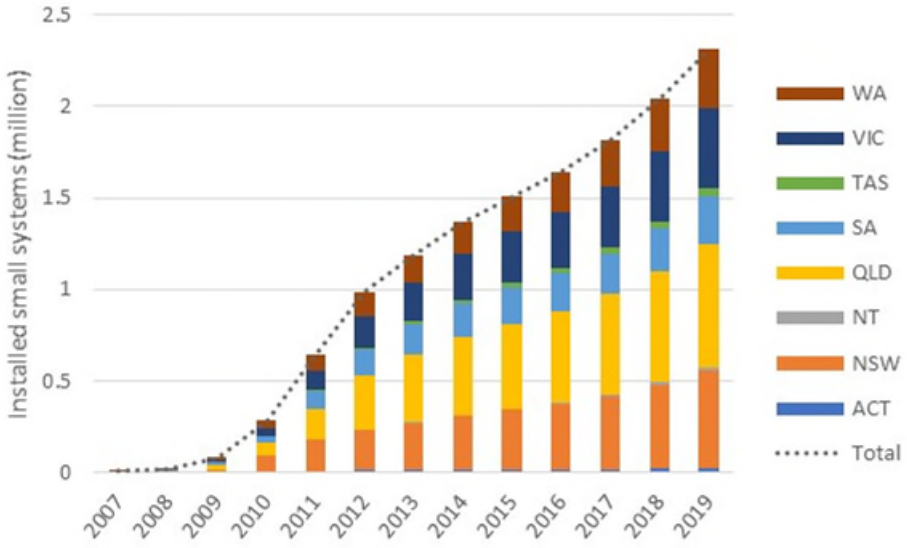
ensure that DER connections and associated goods and services are effective and efficient for system security, distribution network operation and a range of other functions.

2.2.1 The importance of DER technical standards, especially in the current context

The current lack of coordination, lack of planning, lack of resourcing and slow pace of decision making within the various governance arrangements for DER technical standards in place across Australia, means that DER systems deployed today are not necessarily able to deliver the performance levels and service levels required. As DER uptake continues to accelerate in Australia, there is an urgent need to reform governance of technical standards to ensure that all new systems installed can meet the technical performance levels required.

Australia is well into the "early majority" phase of the technology adoption lifecycle for rooftop PV and the rise of the "prosumer", illustrated in Figure 10 below, adding 2.4 gigawatts of small scale rooftop solar in 270,000 installations in the 2019 calendar year (a new record by a big margin).[17] This passed the 10 gigawatts total capacity milestone and over 2.3 million systems, or 19 percent of Australia's 12 million households. Eighty seven percent of these capacities and install numbers are in the NEM. In 2020, it is anticipated another 350,000 rooftop installations will occur for a total of circa 3 gigawatts.

Figure 10 Adoption curve for small scale solar PV generation (capacity)



Source: CER postcode data for small scale installations.

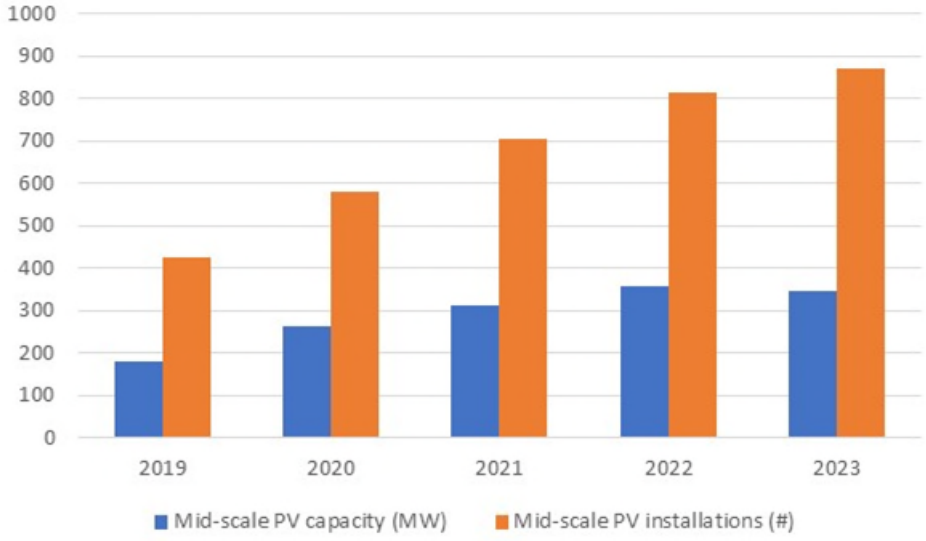
Figure 11 shows the CER's projections for the growth in scale solar PV generation installations and capacity.

Rooftop solar PV is only one of a series of DER technology adoption waves that have and will impact the power system, following the adoption of heat pump air-conditioners (increasing

[17] From Roger's diffusion of innovations theory, using a bell curve to categories demographics of innovators, the "early majority" are that third of consumers raising the level of penetration to 50 percent – that is half of consumers owning, in this case, rooftop solar PV.

peak load) and energy efficient appliances and lighting (decreasing load) and preceding the adoption of household battery systems (increasing self-consumption and time-shifting load) and electric vehicles including vehicle-to-grid (V2G) technology (potentially increasing load and/or self-consumption and decreasing load or load time shifting).

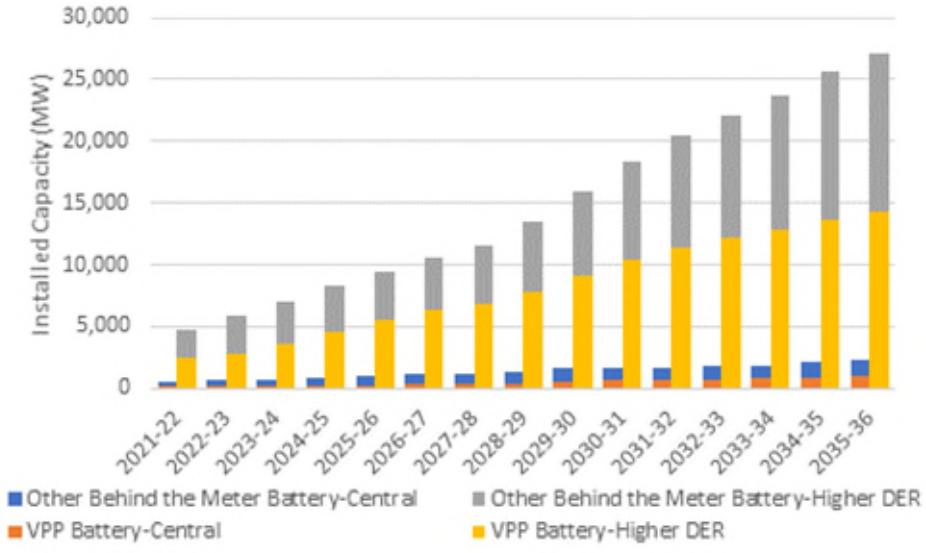
Figure 11 Forecast for mid-scale solar PV generation



Source: Jacobs, Mid-Scale PV Uptake Forecasts, Clean Energy Regulator, 2 October 2019.

Figure 12 shows the projection of behind the meter battery storage adoption from the ISP for both the Central and Higher DER planning scenarios. These indicate somewhere between 1 and 10 GW of behind the meter battery storage installed over 15 years, about half of which is integrated into virtual power plants.

Figure 12 ISP projection of behind the meter battery adoption (capacity)

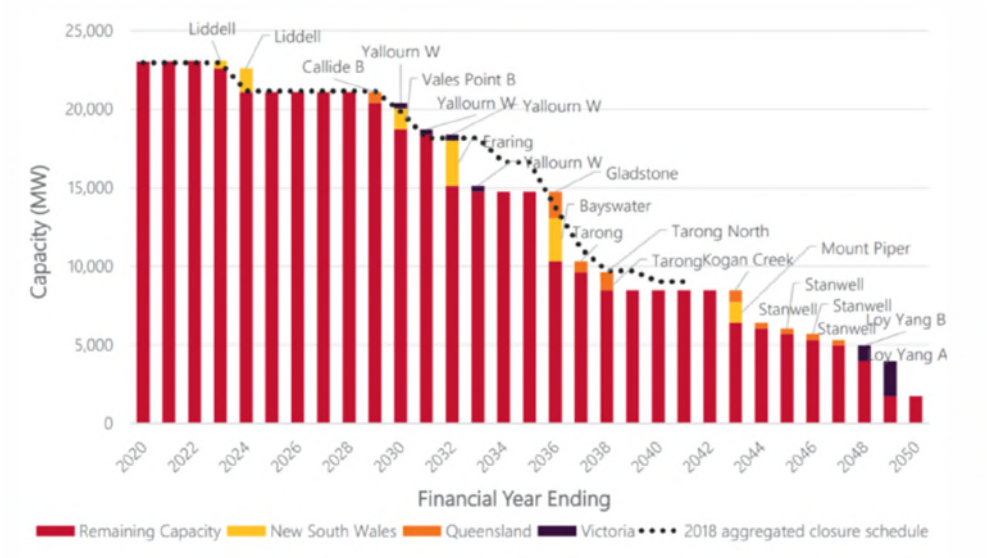


Source: AEMO Draft 2020 ISP Generation Outlook, Appendix 3

As DER penetration increases, Australia will be leading the world in having the most decentralised electricity supply. Therefore, International Standards development is unlikely to support the timeframes required to assist local requirements in Australia. (Network stakeholder)

At the same time the 2020 ESB Health of the NEM report, highlights increasing risks to NEM reliability and security due to a combination of aging generation plant and an increase in the incidence and severity of extreme weather events. The AEMO's 2020 Draft ISP highlights the important role of DER in reducing the cost of replacing retiring coal plant, starting with Liddell in 2022.

Figure 13 Expected exit of generators from the NEM



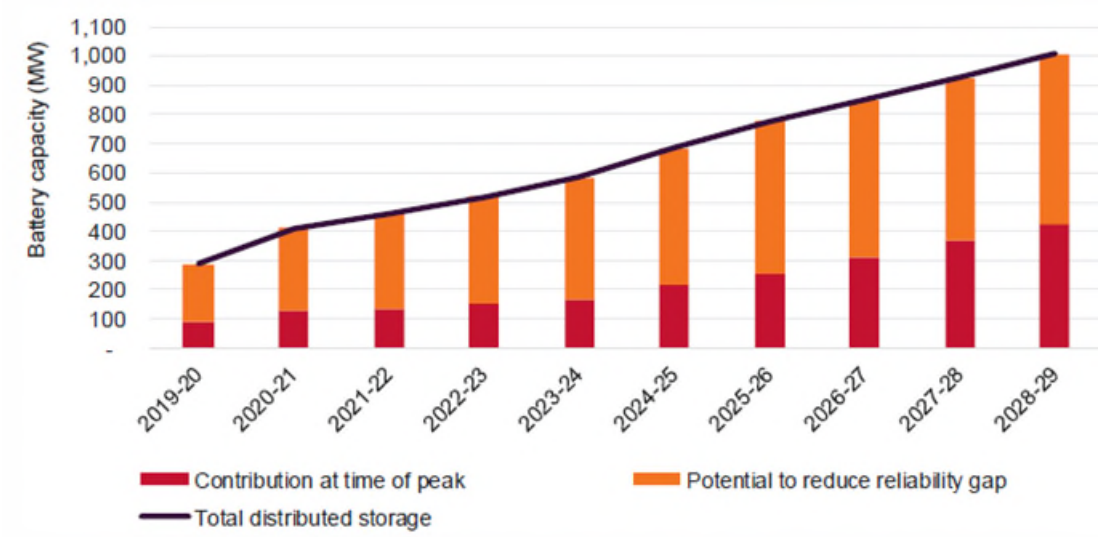
Source: ESB, The Health of the National Electricity Market, Volume 1, 2019

Over the next 15 years, 8-10 GW of existing generation is due to retire and will require replacement. At the same time some 10-15 GW distributed generation and 1-10 GW behind the meter storage including VPPs are likely to be installed. The Draft ISP indicates that DER could allow some replacement utility scale generation (and transmission) costs to be avoided, without compromising reliability and security.

The 2019 AEMO Electricity Statement of Opportunities (ESOO) forecasts a potential 'reliability gap' leading up to and following the exit of large generators over the coming decade and beyond. It also highlighted that the forecast increase in DER uptake has the potential to play a key role in addressing any 'reliability gap' that emerges as generation withdraws from the market. The forecast maximum potential for DER contribution to reducing the 'reliability gap' is illustrated in the AEMO ESOO figure below.[18]

[18] See 2019 AEMO ESOO pp 90 and 91

Figure 14 Forecast maximum potential DER in Victoria, SA and NSW 2019 to 2029



Source AEMO 2019 ESOO

AEMO modelling shows that, if better coordinated, there is the potential for DER to provide up to 580 MW of additional supply at times of peak demand by 2029.[19] Even half of this capacity is significant relative to:

- The capital and ongoing cost of augmenting transmission (including inter-connectors) to deliver equivalent capacity during peak demand periods
- The capital and ongoing cost of new peaking generation capacity (gas) that may only be used rarely and is therefore very high cost
- The impact on average annual wholesale prices (physical and forward) around and during peak demand periods and where there is a possible 'reliability gap'
- The higher likelihood of a need to activate reserve trading arrangements, with associated costs.

AEMO's modelling of DER in the ESOO, particularly battery storage capacity, reflects uncertainty around how these systems will operate in the future. The majority of the battery systems are assumed to operate according to a profile centred around retail tariffs. As such, these systems do not necessarily respond to wholesale market signals in a way that maximises their ability to moderate peak demand. The systems that are modelled as VPPs are optimised within the AEMO supply model, and therefore operate to reduce unserved energy (USE) to the maximum extent possible.

AEMO highlights it is necessary to develop monitoring and dispatch systems and regulatory frameworks that enable DER to operate to meet power system needs, including how battery storage is incentivised and coordinated at times of peak demand.

[19] According, to the AEMO, this is an upper estimate, because there are some occasions where USE events would last for more than 2.5 hours, and therefore no level of coordination would allow batteries to maintain their level of discharge across the entire USE event without deeper storage capability.

"Governance models need to evolve to address the emerging impacts of DER on the bulk power system. New challenges and operational risks are emerging for AEMO in integrating high levels of DER across the power system. The materiality of DER risks and the consequences of failing to manage them are escalating with higher levels of DER. Governance processes to support high levels of standards adoption and compliance must be strengthened. Minimum device performance and operating capabilities are required, with those capabilities appropriately guided by AEMO."
(Market body stakeholder)

2.2.2 Why DER standards matter for future market development

DER can be capable of providing passive and active system services that impact the reliability, security and affordability of electricity for consumers, as shown in Table 4.

DER capabilities also open opportunities for market participants, including but not limited to, demand aggregators to develop new DER platform-based products and services. This may include commercial platforms to support consumer investment in active DER installations. Effective and efficient DER platforms (enabled by DER technical standards) are therefore likely to be a crucial pre-requisite for high levels of future consumer investment in active DER, enabled by batteries, as revenue from the supply of VPP services would make a substantial improvement to the economics of active DER investments.

Table 4 Long term interest of consumers

Note that columns do not align as relationships are complex not linear.

Long term interest of consumers				
Reliability/Security		Affordability		
Passive DER		Active DER		
DER technical standards mitigate network risks	DER technical standards mitigate system risks	DER technical standards ensure that DER customers do not face overly onerous (high cost) requirements	DER technical standards enable DER customers to provide network services at lower cost than business as usual (BAU)	DER technical standards enable DER customers to provide wholesale and ancillary services at lower cost than BAU

DER passive system services such as, for example, automated or passive inverter frequency and voltage control in response to local network conditions. DER technical standards underpin this basic system service. Given communication and control capabilities, such services can be called upon actively and in aggregate by system operators.

In combination, DER goods and services can support a series of interacting, two-sided, markets, whereby DER can efficiently and effectively provide services to the NEM that are similar in scale, quality, predictability and reliability to the services currently provided by

utility scale generation.[20] This is the concept of virtual power plants (VPP).[21] According to AEMO, VPP are behind the meter batteries that participate in the NEM and thereby become controllable resources.

Effective DER systems delivering both active and passive services require high levels of compliance with DER technical standards. This includes an adequately trained workforce and associated training and human resource planning. It also includes a strong system of performance monitoring and measures to ensure compliance, including provision of penalties for non-compliance.

Some of the benefits from passive and active DER services and products can be efficiently applied to transfers (payments) from consumers without DER installations to consumers with DER installations. Such payments support a higher level of consumer investment in DER installations than otherwise. This increases opportunities for the efficient substitution of generation, storage and transmission augmentations by DER investments.[22]

Effective DER systems delivering both active and passive services require high levels of compliance with DER technical standards. This includes an adequately trained workforce and associated training and human resource planning. It also includes a strong system of performance monitoring and measures to ensure compliance, including provision of penalties for non-compliance. Efficient and effective DER platforms contribute to lower cost, reliable and secure electricity supplies. This is because DER platforms delivering VPP can reduce the scale of dispatchable generation required. DER platforms enable low cost, reliable replacement of all the services supplied by existing electricity generation. DER platforms offer the opportunity to advance the achievement of the NEO for the benefit of Australian electricity consumers and producers, and intermediaries.

There is a significant lead time in developing effective DER platforms, capable of providing DER services reliably and securely. Any material delay could result in higher than efficient generation replacement costs and/or lower levels of reliability and security.

2.3 Governance vs. governing DER technical standards

This section describes in more detail how the general governance concepts of structures and processes

2.3.1 DER technical standards governance system

The linkages between the design of DER technical standards governance system, and the potential contribution of DER platforms to the achievement of the NEO, are illustrated in Figure 15 below. The governance structures on the left support a set of processes for

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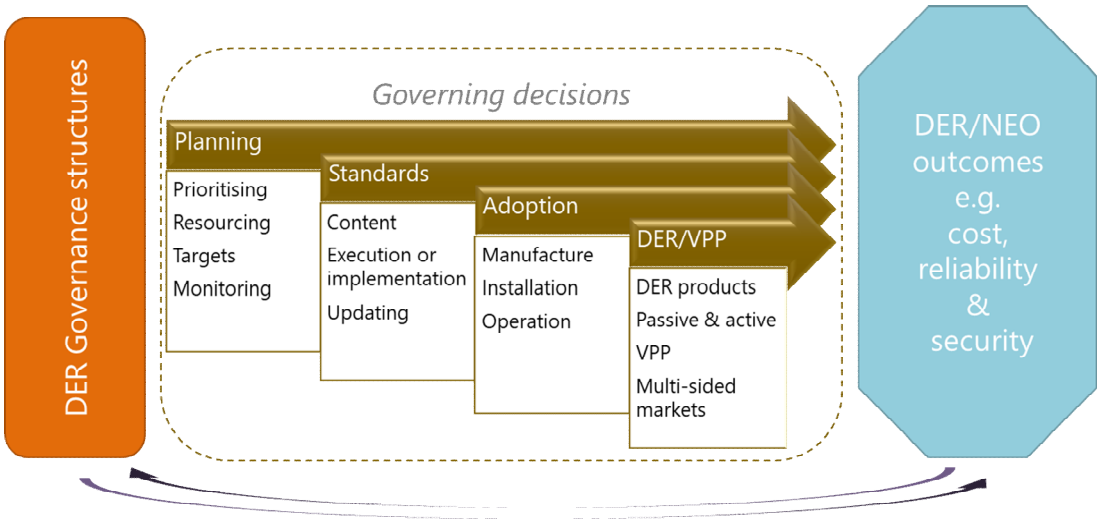
20 See AEMO, Draft 2020 Integrated System Plan, December 2019, available from https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/ISP/2019/Draft-2020-Integrated-System-Plan.pdf

21 Ibid. page 49.

22 For the avoidance of doubt, we are not making any claims regarding the efficient level of substitution by DER for utility-scale generation, storage and network supplied equivalent services. We are simply observing that some level of substitution is efficient, based the extent of uptake by consumer markets so far, and in the forward-looking analysis by the AEMO in the Draft 2020 ISP.

making governance decisions in the centre - together the DER governance system - that deliver outcomes supporting the NEO and specific DER objectives.

Figure 15 Delivery of DER outcomes by DER governance systems



The scope of the project presented in this report are the governance systems illustrated. Each system, which typically corresponds with a Statute, involves a governance structure, under which governing decisions are allocated and guided. Governing decisions consist of the chain of governing actions depicted from the planning of the development of DER technical standards through to the delivery of DER goods and services. This includes performance monitoring and compliance arrangements to ensure technical standards are being adopted and applied to the required performance metrics.

The focus of this report is assessing whether the DER governance structures (the content of the orange rectangle to the left) are capable of ensuring that governing actions (arrows in the middle) can be reasonably expected deliver DER outcomes consistent with advancing the NEO (the blue shape on the right), COAG Energy Council objectives for affordable energy and satisfied consumers and the ESB's DER integration objective.[23] The report therefore seeks to identify any shortcomings in governing decisions and actions, on DER technical standards, that are attributable to the design of DER technical standards governance system.

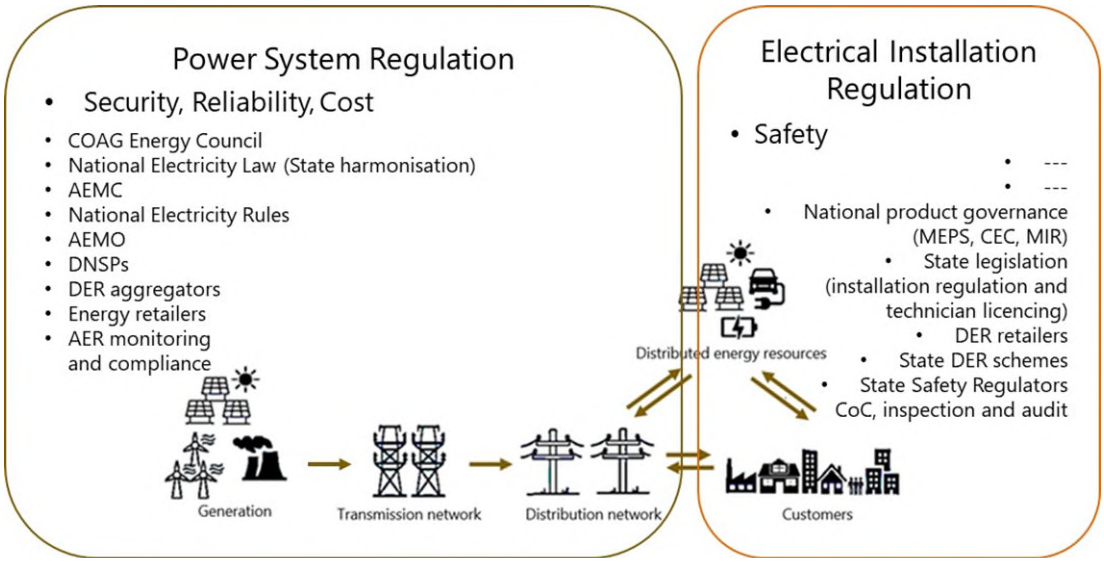
The assessment is concerned with the extent the achievement of the desired outcomes is constrained or put at risk by limitations or shortcomings in the current DER technical standards governance system. Addressing each individual DER governing decision and action is a matter for the relevant governing entities and is for the most part outside the scope of this report. In the course of identifying problems with DER decisions and actions, we have identified opportunities for early actions to improve DER technical standards governing (processes for decision-making). These early actions could be undertaken in parallel with any steps to change or reform the DER technical standards governance system.

[23] See COAG Energy Council, Strategic Energy Plan, November 2019 , and ESB, *DER Integration Workplan*, October 2019

2.3.2 Challenges to Australia's electricity regulatory system

The take up of DER by consumers, challenges the decades old regulatory divide in the electrical system, represented schematically by Figure 16. Generally, there is a boundary at the consumer's property, dividing two regulatory regimes. The regulation of the power system has been physically and legally harmonised in the NEM.

Figure 16 The challenges of DER straddle the regulatory divide in the electrical system



While there are some national regulations of the safety of products used by the consumer, the regulation of electrical installations and licencing of electricians remains heterogenous, with no national coordinating forum and little has been achieved towards national harmonisation despite Productivity Commission calls for harmonisation of these regulations in 2006 and 2017.[24]

The whole regulatory system encapsulated by Figure 16 includes somewhere between 16 and 40 Acts as well as subsidiary regulations in all Australian Commonwealth, State and Territory jurisdictions.

By definition, the DER installations that *prosumers* invest in on their property straddle these two regulatory regimes. However, all existing DER governance structures and processes are on either side of the boundary, and none integrate across it and there is no joined up decision making across the two regulatory domains. Those contiguous initiatives that do exist are ad-hoc arrangements that recognise the necessity of integrated systems of DER governance.

Naturally, the DER community that regularly engage with this regulatory disjunct, struggle with its consequences:

[24] See https://www.pc.gov.au/inquiries/completed/consumer-product-safety/report and https://www.pc.gov.au/inquiries/completed/consumer-law/report respectively

"[DER is in an] awkward space between consumer-focused appliance connected to an essential services."
(Industry stakeholder)

"It is very hard to understand why we need different electrical safety rules in different states."
(Industry stakeholder)

"DER is inside the consumers electrical installation and as such falls under different jurisdictional regulators to those who have historically managed connection to the NEM. This is causing some issue establishing who is responsible for standards."
(Industry stakeholder)

"Longer term convergence of jurisdictional technical regulation as per the building code model. As regulators recover their costs through utility licencing, this would be a saving to consumers."
(Industry stakeholder)

"Get States to agree to harmonise safety regulation."
(Consumer stakeholder)

"Little political appetite to impose on consumers."
(Industry stakeholder)

"There is a general reluctance from Government to manage compliance obligations on consumer for equipment in their home. (e.g. safety switches, smoke alarms, pool fences) even if regulatory obligation are put in place to require equipment to meet certain standards, work needs to be done to ensure frameworks are in place to manage compliance with these obligations."
(Industry stakeholder)

2.3.3 Overview of existing governance arrangements for DER technical standards

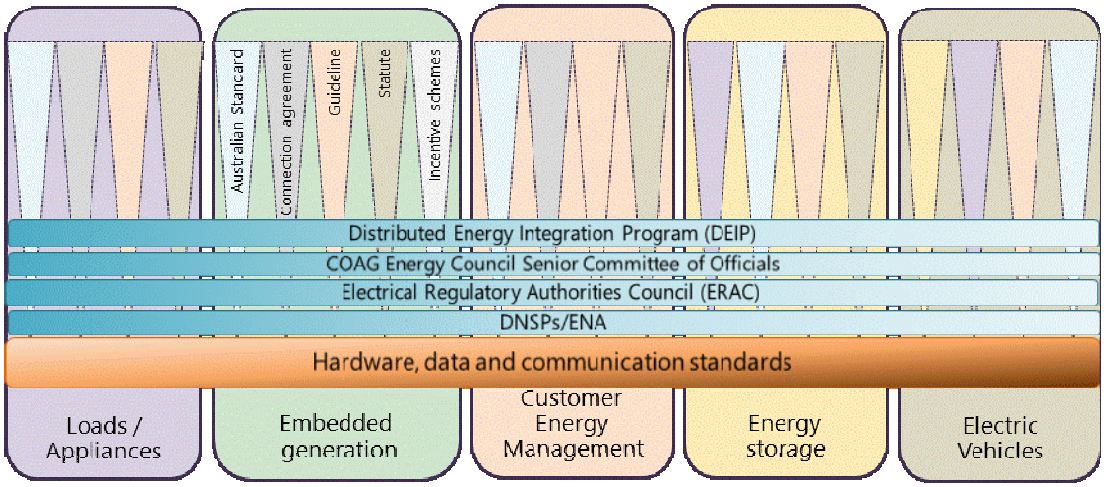
Currently, there are a range of arrangements in place which govern the way DER technical standards are developed, maintained, complied with and enforced in Australia.

Figure 17 schematically depicts the parallel governance arrangements for the production of DER technical standards represented by the inverted triangles (introduced in Figure 6) that currently co-exist both within and between different DER technologies or sub-sectors.[25] These governance processes are responsible for the production, maintenance, implementation and compliance of various hardware, data and communications standards. These are depicted as a layer across all DER technologies – as a group all standards are within scope, but this does not imply that any individual standard is common or interoperable across all DER technologies. Without deliberate coordination, these processes and the technical standards they produce exist in siloes.

[25] That is, as introduced in discussion of Figure 6 each triangle in section 1.2 represents a governance system commencing a source of authority, a governance entity making decisions about design of technical standards, and various mechanisms for production, implementation, verification and enforcement of compliance with the standard.

In addition to vertical siloes, there are multiple horizontal networks of stakeholders in the DER community that are attempting to coordinate actions across standards and DER technologies - some but not all of these are identified in Figure 17. These networks vary in formality, the frequency with which they meet, the breadth of their agenda (that, for example, may not cover all the DER technologies). There is limited evidence that these networks are coordinated with each other.

Figure 17 Overview of existing governance arrangements for DER technical standards



The governance outcomes under the existing governance arrangements can be described by seven main arrangements as set out in Table 5 below.

Table 5 Governance arrangements

Governance arrangements	Current examples
Arrangement 1 – Australian and international Standards	Various Australian and international standards, e.g. AS 4777 for network connected inverters. These standards are voluntary until invoked in legislation, regulation or contract.[26]
Arrangement 2 – Infrastructure provider (DNSP) requirements	DNSP connection agreements (contracts) for customer connection to the grid.
Arrangement 3 – State based incentive/rebate schemes	Various incentive, rebate and low interest loan programs supporting DER deployment, which include technical standards as conditions for incentives, for example: • Victorian Solar Homes Program • South Australian Battery Scheme

[26] For example, AS 4777 is referenced in the following: Commonwealth Renewable Energy (Electricity) Regulations 2001; Western Australian Electricity (Licensing) Regulations 1991; South Australian Electricity (Feed-In Scheme--Solar Systems) Amendment Act 2008; Tasmanian Electricity Supply Industry Act 1995. (search http://www.austlii.edu.au/). AS 4777 is also referenced in AS 3000 (Wiring Rules), which in turn is referenced by all states and territories within state and territory based electrical safety legislation and regulation.

	• Queensland Interest Free Loans for Solar and Storage • New South Wales Empowering Homes Program • ACT Next Generation Storage Program • ACT Solar for Low Income Households Program
Arrangement 4 – Commonwealth incentive/rebate schemes	Small Scale Renewable Energy Scheme, includes technical standards (e.g. AS 4777 for network connected inverters for solar PV installations) for STCs certification.
Arrangement 5 – State based legislated requirements	State-based electrical safety requirements for installations cite a large range of Australian Standards
Arrangement 6 – Commonwealth based legislated requirements	GEMS is a national framework for product energy efficiency and efficiency labelling in Australia.
Arrangement 7 – Requirements for market participation	VPP that aggregate and control DER are required to satisfy technical requirements to participate in the wholesale market.

Each of these arrangements is examined in detail in the assessment of the according to its fitness for purpose for the current and future contexts below

2.4 Statement of proposed public policy objectives

The connection between governance of DER technical standards and energy market outcomes of interest from a public policy perspective has been spelt out in the preceding chapter.

This section sets out a statement of proposed high-level policy objectives for the governance of DER technical standards. This provides the basis for the problem definition in the following chapter and the options identification and evaluation in the final chapter. It also sets out the ESB DER integration vision.

2.4.1 High level policy objectives

The framework for identifying public policy objectives follows the six metrics identified in the ESB's Strategic Energy Plan[27] and used in the ESB's Health of the Electricity Market report[28], with adaptations for DER technical standards governance. It is summarised in the table below.

[27] See Energy Security Board Strategic Energy Plan

[28] See Energy Security Board Health of the NEM, February 2020

There is a potential win-win both for all consumers and for consumers investing in certain DER installations and appliances capable of supplying services to other consumers – whether active or passive. A no-win outcome is one under which there is substantial consumer investment in DER installations and appliances, alongside substantial utility investment in replacement of exiting generation, including storage and network capacity, resulting in widespread inefficient duplication of overall capacity and much higher overall electricity supply costs. A qualitatively similar outcome has emerged in some cases where network capacity now exceeds required capacity by a substantial margin, because of demand moderation from DER that was not incorporated into network augmentation decisions.[29]

Table 6 Proposed DER technical standards policy objectives

Strategic Energy Plan objective (performance metric)	Proposed DER technical standards policy objectives
Affordable energy and satisfied customers	Outcomes that contribute to lower energy costs and customer satisfaction, whether customers are participating directly in DER markets or not, including by avoiding the cost of dispatching or investing in utility scale generation or storage, where such dispatch of investment would be less efficient than use or investment in DER products and services.
Secure electricity system	Outcomes that support deployment of visible, flexible, DER installations able to provide essential system security services.
Reliable and low emissions electricity supply	Outcomes that support reliable and low emissions supply, including by avoiding the cost of higher marginal cost, higher emissions generation (compared with DER), to remain within the NEM reliability standard.
Effective development of open and competitive markets	Outcomes that support the development of competitive markets for DER products and services, thereby supporting a higher rate of efficient uptake of DER installations than otherwise.
Efficient and timely investment in networks	Outcomes that avoid investment in networks – or reduce the costs of delay in network investments - where DER installations may be able to offer visible, secure and reliable substitutes for regulated network services, yielding lower network costs over time and contributing to the affordability, security and reliability objectives above.
Strong but agile governance	A DER technical standards governance system in place that is capable of adaptive regulation for the timely delivery of the outcomes above. Performance targets are set for all entities governing development and implementation of DER technical standards, and their adoption in multi-sided markets, alongside appropriate monitoring and compliance, enabling early detection and remedies for any emerging integration or

[29] See recommendation 11 of the ACCC's July 2018 final report Restoring electricity affordability & Australia's competitive advantage, which recommended that 'The governments of Queensland, NSW and Queensland should take immediate steps to remedy past over-investment of their network businesses in order to improve affordability of the network…'

	performance problems that could jeopardise achievement of the outcomes above.

3. Current state of existing governance arrangements

3.1 Assessment framework

3.1.1 Overview

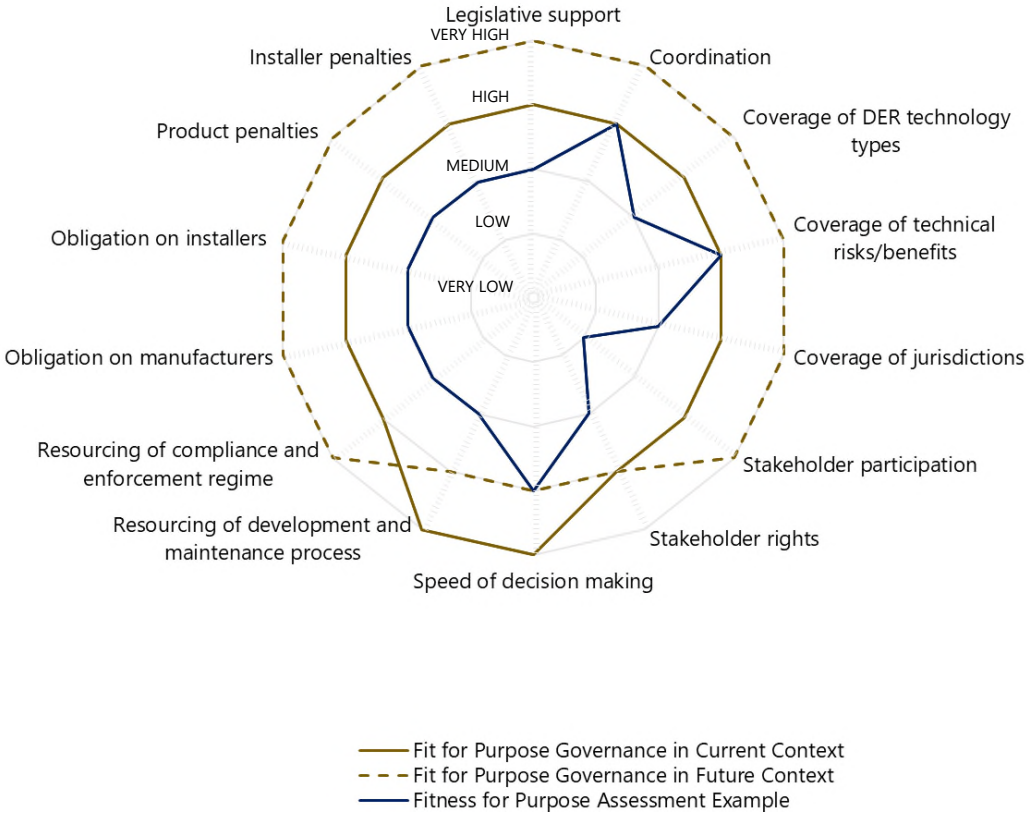
The assessment framework underpinning the review sets out:

- The fourteen dimensions against which existing governance arrangements for DER technical standards are assessed
- Requirements for a fit for purpose governance arrangement in the current context
- Requirements for a fit for purpose governance arrangement in the future (five to ten years' time) context.

The framework is then used to assess the extent to which current governance is fit for purpose in both the current context and future contexts.

A general example of how the assessment framework works is shown below in Figure 18.

Figure 18: Example assessment



The assessment framework is then used as follows to identify fitness for purpose:

- The extent to which the governance polygon (in blue) lies within the current fit for purpose polygon (in solid gold) is an indication of lack of effectiveness
- The extent to which the governance polygon (in blue) lies within the future fit for purpose polygon (in dashed gold) is an indication of lack of effectiveness.

For the example presented above, the governance is assessed as generally not effective in the current context in relation to the resourcing of development and maintenance process. The example governance is even less effective in the future context.

3.1.2 Governance dimensions

The assessment framework identifies fourteen dimensions of governance arrangement. A high score on each dimension indicates that the governance arrangement generally has a high resource intensity. A lower score indicates a lower overall resource intensity. The dimensions are as follows:

Structure

1. Legislative support – Extent to which the governing body has legislative mandate to enable DER technical standards.
2. Coordination – Extent to which structure allows for decisions to be coordinated across the various operational and jurisdictional contexts in which DER operates.

Coverage

3. Coverage of DER technology types – Extent to which governance arrangements are able to cover all DER types.
4. Coverage of technical risks/benefits – Extent to which governance arrangements are able to cover all technical risk and benefit types (including network, system security and customer benefits).
5. Coverage of jurisdictions – Extent to which governance arrangements are able to cover all Australian jurisdictions.

Standards Development Processes

6. Stakeholder participation – Level of stakeholder participation in decision making.
7. Stakeholder rights – Ability for all participating stakeholders to affect outcomes.
8. Speed of decision making – Speed at which decision makers are required to come to a decision.

Resourcing

9. Resourcing of development and maintenance – Level of resourcing for development and maintenance.
10. Resourcing of compliance and enforcement regime – Level of resourcing for compliance and enforcement.

Compliance and enforcement

11. Obligation on manufacturers – Extent to which DER manufacturers are obligated to adopt technical standards by use of mandated requirements or incentives.
12. Obligation on installers – Extent to which DER installers are obligated to adopt technical standards by use of mandated requirements or incentives.
13. Product penalties – Severity of penalties for non-compliances by product manufacturers.
14. Installer penalties – Severity of penalties for non-compliances by installers.

3.1.3 Defining fit for purpose

There is no one governance arrangement which is fit for purpose for all contexts. In order to assess current governance, the assessment framework identifies what is fit for purpose for each governance dimension in both the current and future context as shown in Table 7 below.

Table 7: Fit for purpose governance in current and future contexts

Governance dimension	Current context		Future context	
	Required level	Rationale	Required level	Rationale
1. Legislative support	High	Impact of technical risks is increasing with increasing penetration. Stakeholder interests are misaligned.	Very high	Increasing penetration of DER further increases technical risk especially at system level relative to current context.
2. Coordination	High	Multiple technology types, operational contexts and jurisdictional differences. Large number of stakeholders.	Very high	Increasing technology types and number of stakeholders relative to current context.
3. Coverage of DER technology types	High	Multiple DER technology types exist.	Very high	Increasing technology types relative to current context.
4. Coverage of technical risks/benefits	High	Multiple types of technical risks and benefits impacting a range of stakeholder types.	Very high	Increasing penetration of DER further increases technical risk especially at system level relative to current context.

Governance dimension	Current context		Future context	
	Required level	Rationale	Required level	Rationale
5. Coverage of jurisdictions	High	Most jurisdictions have DER penetration at significant levels to result in material network risks. Some jurisdictions have DER penetration at significant levels to result in material system risks.	Very high	Almost all jurisdictions have DER penetration at significant levels to result in material network risks. Most jurisdictions have DER penetration at significant levels to result in material system risks.
6. Stakeholder participation	High	Large number of stakeholder types potentially impacted by technical risks/benefits.	Very High	Increasing number of stakeholder types potentially impacted by technical risks/benefits compared to current context.
7. Stakeholder rights	High	Competing stakeholder interests and high degree of heterogeneity of stakeholder capacity to participate.	High	No material change in context.
8. Speed of decision making	Very high	Very fast changes in market design for operation of DER services. Fast changes in technology required to respond to technical risks.	High	Market design is somewhat settled compared to current context but fast changes in technology still required.
9. Resourcing of development and maintenance	Very high	Very fast changes in market design for operation of DER services. Fast changes in technology required to respond to material technical risks.	High	Market design is somewhat settled compared to current context but fast changes in technology still required.
10. Resourcing of compliance and enforcement regime – Level of resourcing	High	High technical risk level requiring high levels of compliance.	Very high	Very high technical risk level requiring very high levels of compliance.

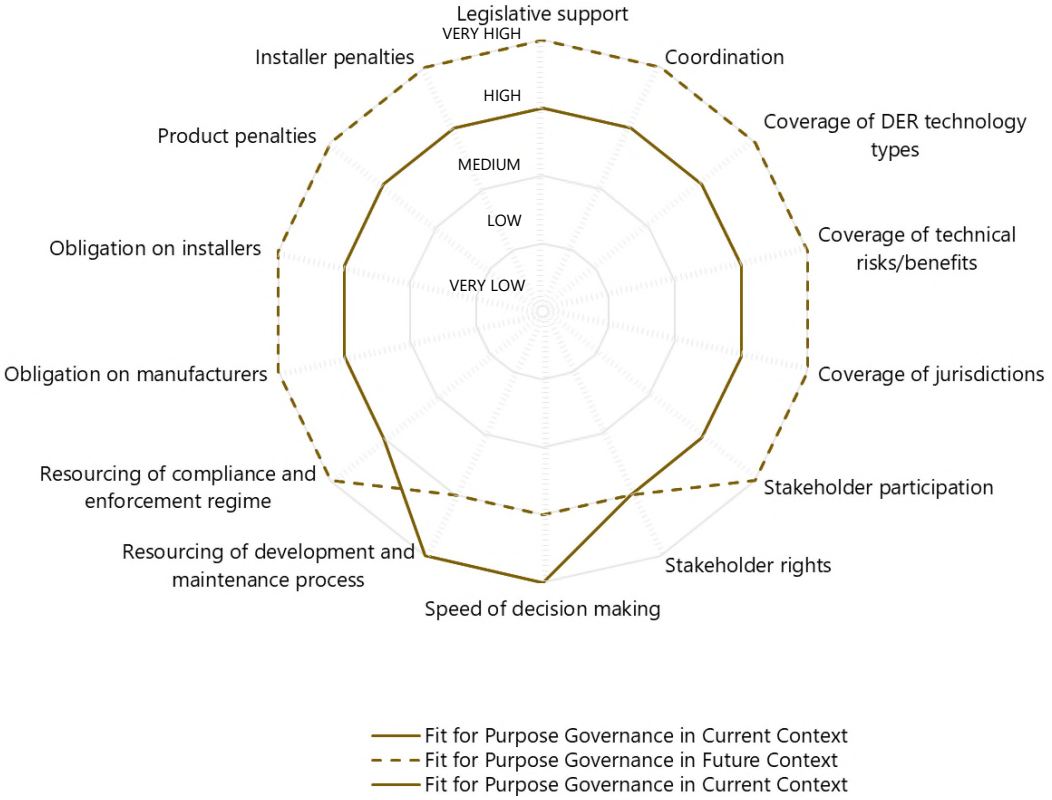
Governance dimension	Current context		Future context	
	Required level	Rationale	Required level	Rationale
11. Obligation on manufacturers	High	High technical risk level requiring high levels of compliance.	Very high	Very high technical risk level requiring very high levels of compliance.
12. Obligation on installers	High	High technical risk level requiring high levels of compliance.	Very high	Very high technical risk level requiring very high levels of compliance.
13. Product penalties	High	High technical risk level, with potential for material non-compliances by product manufacturers.	Very high	Very high technical risk level, with potential for material non-compliances by product manufacturers.
14. Installer penalties	High	High technical risk level, with potential for material non-compliances by product manufacturers.	Very high	Very high technical risk level, with potential for material non-compliances by product manufacturers.

Fitness for purpose in both the current context and future context can therefore be visualised in Figure 19 below.

Fit for purpose governance in the *current* context is defined as high across all dimensions with the exception of speed of decision making, and resourcing of development and maintenance of standards. Fit for purpose governance for these two dimensions is defined as very high given the fast pace of change of technology and markets in the *current* context.

Fit for purpose governance in the *future* context is defined as very high across all dimensions, again, with the exception of speed of decision making, and resourcing of development and maintenance of standards. Fit for purpose governance for these two dimensions drops down to high in the *future* context under the assumption that the rate of change in market structures and technology will be less in five to ten years than current.

Figure 19: Fitness for purpose governance in current and future contexts



3.2 Assessment of existing governance arrangements

The range of governance arrangements currently in place for the governing of DER technical standards are summarised in Table 5. Each of these arrangements is described and assessed according to its fitness for purpose for the current and future contexts.

3.2.1 Australian and international standards

Description

Currently, in Australia, there exists a range of technical standards which relate to DER which are set out in formal Australian or international Standards. Critically the formal Australian and International Standards are voluntary and not mandatory unless they are adopted in legislation or regulation as part of the other governance arrangements discussed further below (see for example section 3.2.4).

Structure

Australian standards are developed by Standards Australia via its defined process[30]. Standards Australia is recognised, through a Memorandum of Understanding[31] with the Australian government, as the peak non-government standards development body in Australia. Standards Australia is a company limited by guarantee, with members representing groups interested in the development and application of technical standards and related products and services.

There are a range of other international standards of relevance to DER developed by formal industry organisations including International Organization for Standardization (ISO), Institute of Electrical & Electronic Engineers (IEEE) and International Electrotechnical Commission (IEC). Standards Australia is Australia's representative[32] on ISO and IEC, but not on IEEE[33].

International standards may (and frequently do) become Australian Standards via the Standards Australia process, which enables Australia-specific applications to be considered. Conversion to Australian Standards is not required in order for the standard to be adopted. International standards (without an equivalent Australian Standard) are frequently cited within network connection arrangements for example. There can be advantages to formally adopting an international standard as an Australian Standard, including that Standards Australia already has licencing arrangements in place with the international standards organisations.

Coverage

Australian and international standards cover a broad range of technologies and technical risks, both within the energy sector and beyond, with an aim to ensure that products, services, and systems operating in Australia are safe, consistent, and reliable.

Australian Standards developed within the Energy and Electrotechnology sector are capable of addressing all types of DER and all types of technical risks.

Australian Standards and international standards can be adopted in any jurisdiction. Australian Standards may also be adopted internationally.

Standard development processes

Decisions with respect to technical requirements within Australian Standards are developed by individual technical committees. The technical committees are comprised of

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30 Standards Process: Process involved from proposal to publication, available from https://www.standards.org.au/standards-development/developing-standards/process

31 Memorandum of Understanding between The Commonwealth of Australia and Standards Australia, available from https://www.industry.gov.au/sites/default/files/2018-12/standards-australia-memorandum-of-understanding-13-november-2018.pdf

32 Standards Australia, Australian involvement in international standardisation, SG 015, available from https://www.standards.org.au/getmedia/25db223b-7196-4369-b111-be43891f61f5/SG-015-Australian-Involvement-in-International-Standardisation.pdf.aspx

33 However, in 2019, Standards Australia and IEEE have signed an agreement to expand the range of standards for use in the Australian market. Statement of agreement between Standards Australia and IEEE, available from https://www.industry.gov.au/sites/default/files/2018-12/standards-australia-memorandum-of-understanding-13-november-2018.pdf

representatives from "Nominating Organisations"[34]. Nominating organisations are approved by Standards Australia and must:

- Be a government or regulatory agency or organisation that represent a specific interest area
- Have its headquarters based in Australia
- Have an Australian membership base (ideally should be an Australia wide organisation)
- Represent a constituency
- Have publicly available information (i.e. a website)
- Abide by a code of conduct.

Standards Australia determines the composition of each technical committee (in terms of the Nominating Organisations to be represented) aiming to "*ensure balanced participation by those interests that will be significantly affected by the resulting Standard*". The Nominating Organisations then nominate individual representatives who must be approved by Standards Australia.

The technical committees formed to develop DER technical standards tend to be well represented by distribution networks and market bodies, with sufficient resources and incentives to fully participate in the process.

Depending on their complexity, the development of Standards can range from eight months, for projects with a simple complexity, to four years for the most complex projects. The total duration of a Standards development project should not exceed four years.

Once drafted, Standards go to a technical committee for ballot. Committee members vote either affirmatively or negatively. Any negative votes must be accompanied by technical substantiation.

Consensus is considered to have been achieved when:

- A minimum of 67% of those eligible to vote have voted affirmatively
- A minimum of 80% of votes received are affirmative
- No major interest involved with the subject of the Standard has collectively maintained a negative vote.

Once consensus is achieved, Standards Australia publicly announces the availability of the draft Standard, made freely available via the Standards Australia website. The comment period varies but is normally not less than 9 weeks. At the expiry of the comment period, the committee responsible for the document gives consideration to all comments received and determines which proposed changes will be incorporated into the Standard.

Standards Australia also offers "Lower Consensus Publications" which do not require consensus to be achieved including its Technical Specification. Technical Specifications have

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[34] Standards Australia, Nomination Organisation Guide, available from https://www.standards.org.au/getmedia/9dd36462-e2f1-4f71-8f50-3c467affcaf3/Nominating_Organisation_Guide.pdf.aspx

limited transparency in decision making and do not have the support of the full consensus process normally associated with an Australian Standard. However, Standards Australia, suggests the Technical Specification is developed where "*the subject matter, or a related aspect such as the regulatory environment, is undergoing rapid change and where speed of delivery, rather than full consensus, is of paramount importance*."[35]

Resourcing

There are two pathways by which a Standard is developed which determines how it is funded:

- Standards Australia pathway
- Externally funded pathway[36].

Under the Standards Australia pathway, Standards Australia provides a dedicated Project Manager and online meeting and coordination resources. Timelines for standards, developed under this pathway, can sometimes be constrained depending on availability of Standards Australia Resources.

Under the externally funded pathway, there is greater choice in resourcing levels (including via an externally funded project manager) and an accelerated project timeframe. The timeframes still remain subject to Standards Australia Standards Development processes.

It is understood that the current AS 4777 update (due for draft release in March 2020), has followed the Australian Standards pathway.

Regardless of the pathway, the technical committee members' time, including those responsible for drafting, is either on a volunteer basis or covered by the nominating organisations.

Compliance and enforcement

The publication of an Australian or International Standard on its own, does not place any obligations on DER proponents. However, compliance with Australian and international standards is made mandatory for DER manufacturers or installers via:

- Incorporation into legislation or regulations[37] or
- Specification within contractual arrangements.

Manufacturers and installers may also choose to voluntarily comply with Australian or International Standards.

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35 Standards Australia, Standardisation Guide 003: Standards and other Publications, available from https://www.standards.org.au/getmedia/d9da035d-2fbc-4417-98c1-aa9e85ef625d/SG-003-Standards-and-Other-Publications.pdf.aspx

36 Standards Australia, Pathways for Standards Development, July 2019, available from https://www.standards.org.au/getmedia/4429d4d6-e912-4beb-aa3f-4d327161d2b5/Standards-Australia-Pathways-Guide.pdf.aspx

37 For example, AS 4777 is referenced in: Commonwealth Renewable Energy (Electricity) Regulations 2001; Western Australian Electricity (Licensing) Regulations 1991 ;National Electricity (Victoria) Act 2005; South Australian Electricity (Feed-In Scheme--Solar Systems) Amendment Act 2008; Tasmanian Electricity Supply Industry Act 1995. (search http://www.austlii.edu.au/)

Compliance with Australian standards and international standards can be:

- Self-certified
- Certified via an accredited laboratory, i.e. a laboratory that is National Association of Testing Authorities (NATA) accredited in Australia
- Certified via an accredited inspector, i.e. an inspector that is Joint Accreditation System of Australia and New Zealand (JAS-ANZ) accredited in Australia.

The type of certification required depends upon; the requirements of the legislation, regulation or contract which references the standard, and/or the availability of documented testing requirements for certification within the standard itself.

For example, inverter standard AS 4777 is referenced in:

- Commonwealth Renewable Energy (Electricity) Regulations 2001
- Western Australian Electricity (Licensing) Regulations 1991
- National Electricity (Victoria) Act 2005
- South Australian Electricity (Feed-In Scheme--Solar Systems) Amendment Act 2008
- Tasmanian Electricity Supply Industry Act 1995.

AS 4777 is further referenced in AS/NZ 3000 Electrical Installation (Wiring Rules) which is adopted in state based electrical safety installation in all states and territories.

The way in which standards become mandatory can be convoluted. For example, the AS 4777 series for Grid connection of energy systems via inverters is referenced in AS/NZS 3000:2018 Electrical Installations (Wiring Rules). AS/NZS 3000 is a critical safety standard for all electrical installations and is directly referenced in legislation and/or regulation in every state and territory. Therefore, the mandating of AS/NZS 3000 in state and territory based safety legislation is the primary instrument via which AS 4777 becomes mandatory for most forms of DER.

Notwithstanding, AS 4777 is also referenced in the Commonwealth Renewable Energy (Electricity) Regulations 2001 which underpin the Commonwealth Government's Small Scale Renewable Energy Scheme (SRES) (See Section 3.2.4). The SRES establishes the Clean Energy Regulator as the body responsible for compliance and enforcement with technical standards under the regulations. The Clean Energy Regulator, in turn, utilises the CEC accreditation processes (as set out in the Commonwealth Renewable Energy (Electricity) Regulations 2001) to determine compliance of all inverter products with the AS 4777 standards.

Technical and safety regulators (responsible for AS/NZS 3000), as well as DNSPs, and administrators of state and territory-based incentive schemes, all rely on the CEC process to check for compliance with AS 4777 under their various governance arrangements. Each of these arrangements then has different mechanisms for enforcement of AS 4777.

Stakeholder views

Stakeholders reported a highly variable satisfaction with the Standards Australia structure and process in terms of its fitness for purpose for developing DER standards.

Many stakeholders believed the timeframes for the development of an Australian Standard were too slow and not fit for purpose given the fast-changing nature of DER technology and markets. However, stakeholders with direct involvement in the Standards Australia development process viewed the timeframes as appropriate given the level of rigour required.

> *"The Australian standards process is not fit for the rapid pace of transition."*
> *(Government stakeholder)*

> *"There's a general apathy in getting standards developed, the timelines are completely unreflective of the speed at which the DER industry is moving."*
> *(New technology stakeholder)*

> *"Standards Australia should be properly resourced to manage the pace and extent of changes. It needs to be a consultative process to ensure stakeholder interests and issues are fully addressed. That takes time."*
> *(Industry stakeholder)*

> *"Standards development is largely transparent and industry-led, with broad stakeholder engagement and participation."*
> *(Industry stakeholder)*

Some stakeholders were critical of the degree to which the Standards Australia process allows for stakeholders to meaningfully contribute to Standards outcomes. It was reported that, currently, the technical committees are dominated by DNSPs and market and regulatory bodies, due mostly to their ability to fund personnel dedicated to the process. DER manufacturers and vendors, as well as consumer groups, for the most part are not able to dedicate personnel to the process and so their input is limited to the public consultation process. These stakeholders have further criticised the public consultation process as being too short and opaque in terms of how feedback had been considered by the committee. Stakeholders made the comparison with AEMC rule change processes, for example, that document stakeholder submissions and provide the rationale for the final decision.

> *"Gross lack of consumer perspective and presence in these processes. The lack of resourcing for this means it's very hard to get involved and stay involved for potentially very long and detailed development processes. Therefore development is too often led by industry who can afford to resource it (but also have selfish financial incentive to develop standards to suit themselves)."*
> *(Consumer stakeholder)*

Stakeholders were also critical about the lack of clarity and transparency in the objectives in the development of Australian Standards. While Standards Australia has stated objectives which are used in determining whether a Standard should be developed, it is unclear how these objectives, or any other objectives, apply in assessing individual technical requirements. Some stakeholders argued that the Standards development process for any DER-related standards should explicitly call up the NEO in both deciding whether the Standard should proceed and in decision-making with respect to individual technical requirements, where relevant.

> *"There's no transparency on decision making processes or committee determinations (all meetings are commercial in confidence) and there's no real independence. Decisions seem to be influenced by the views of one or two individuals with no accountability or consideration of the impact on customers."*
> *(New technology stakeholder)*

"Overarching principles and objectives are not always aligned with the NEO."
(Market body stakeholder)

Some stakeholders, particularly DNSP stakeholders, stated that despite any actual or perceived shortcomings, the brand recognition of an Australian Standard is well established in the Australian electricity industry and should be retained in any future governance model for DER technical standards.

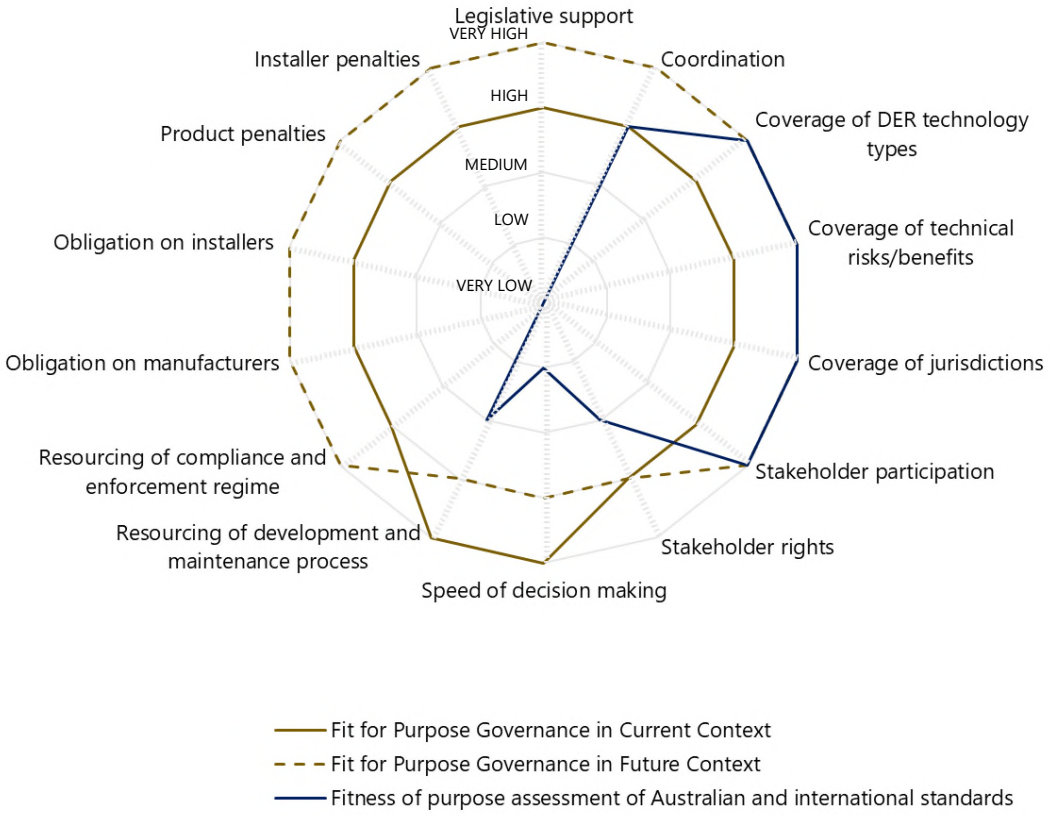
"Development and maintenance of technical standards are strong and well governed processes."
(Industry stakeholder)

Fitness for purpose assessment

The assessment below relates to the development process for Australian and international standards. The assessment of the obligations and penalties relates to the Australian standards process only (where there are no obligations and penalties) rather than the separate governance arrangement which imposes the obligation or penalty.

The key benefits of Australian and international standards is their ability to cover the range of technologies and technical risk types. The rigorous development process in developing and maintaining the standards are also strengths. Stakeholder participation is also assessed as a strength due to the ability for all stakeholders to contribute via either the technical committee or the public consultation process. However, stakeholder rights is assessed as a weakness owing to the ability of some stakeholders (less well resourced) only able to affect outcomes through the public consultation process which has been criticised as not sufficiently transparent.

Figure 20: Fitness for purpose assessment of the voluntary adoption of Australian and international standards



The other key weaknesses of Australian and international standards are the speed of decision making, lack of coordination with the NEO and the lack of formal instrument to mandate their implementation.

3.2.2 Network technical connection standards

Description

Network technical connection standards refers to the technical requirements set by DNSPs in order for DER systems to connect to distribution networks. These standards are generally set out in guideline documents and only become mandatory once they form part of a network connection agreement (the contractual document between the DER proponent and the network).

Structure

In Australia, each DNSP manages the technical requirements for DER systems connected to their networks. The National Electricity Rules set out the relevant requirements for DNSPs including obligations to:

- Process connection applications[38]
- Publish certain information with respect to their technical requirements documents[39]
- Publish an AER approved Model Standing Offer for basic DER connections[40].

The technical requirements themselves are not set out in the National Electricity Rules and rather may be determined by each DNSP, specific to its network.

Energy Networks Australia (ENA) have recently developed and introduced the National DER technical grid connections guidelines[41] to improve the level of consistency across the network connection standards. It is voluntary for NSPs to adopt the requirements of the guideline. There are currently varying degrees of compliance with the guidelines across the 14 Australian DNSPs.

It is understood that ENA does not intend to update the guidelines and is not actively monitoring compliance with the guidelines.

Given that these guidelines are voluntary, and that there is a lack of committed investment in the compliance programme to ensure that the guidelines are being adopted by networks, there is uncertainty in the value of this instrument in increasing the coordination across east and west coast DNSPs.

Coverage

Network connection standards cover DER technologies that are capable of generating or exporting electricity into the distribution network. For the most part, they do not consider electric vehicles explicitly or demand response technologies.

The network connection standards predominantly consider risks to the networks including safety, reliability and power quality. The impact of the technical requirements on consumers in terms of the cost of systems or their ability to export to the network is considered to a varying extent depending on the DNSP. Network connection standards do not explicitly consider safety risks behind the meter, although where possible, relevant safety standards are incorporated within network connection arrangements.

Network connection standards in aggregate cover all jurisdictions. Stand-alone power systems and isolated networks (not owned by the DNSPs) are not covered.

Standards development process

Decisions with respect to the technical requirements within the Network connections standards are developed by the respective DNSPs, guided by the ENA DER technical grid connections guidelines. Subject matter experts within each DNSP are involved in the preparation and maintenance of the document within regular intervals, unless minor or major updates are required sooner due to jurisdictional changes.

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38 NER, Chapter 5: Network connection, planning and expansion, v132, available from https://www.aemc.gov.au/sites/default/files/2019-12/NER%20-%20v132%20-%20Chapter%205.pdf

39 Ibid

40 NER Chapter 5A: Electricity connection for retail customers, v132, available from https://www.aemc.gov.au/sites/default/files/2019-12/NER%20-%20v132%20-%20Chapter%205A.pdf

41 ENA National DER technical grid connections guidelines, available from https://www.energynetworks.com.au/projects/national-grid-connection-guidelines/

The guidelines state that where deviating from the ENA DER technical grid connections guidelines to adopt an alternative setting, structure or approach, DNSPs are still deemed to comply so long as the deviation is set out and justified. However, it is understood that no compliance checks have been undertaken to date.

While AER is required to approve Model Standing Offers for basic connections only, the approval is only contingent on there being no material deficit. The AER does not have the capacity to undertake detailed review of individual technical requirements.

The DNSP determines the level of stakeholder participation and speed in which decision making is undertaken, as well as the ability for stakeholders to affect outcomes.

Depending on the DNSP's internal processes and the number of stakeholders/teams involved in the approval of content, a major update to the network connection standards can take more than 12 months to draft, consult on and publish. Not all DNSPs face the timeframes described above and, in contrast, some are able to implement updates and undertake relevant processes in shorter timeframes.

Resourcing

DNSPs are appropriately resourced to develop their network connection standards through their operational expenditure allowances. However, DNSPs are generally not resourced to carry out compliance and enforcement activities. For larger connections (generally greater than 30 kW), some of the costs of compliance checking are recovered via the connection charges. However, DNSPs are unable to recover costs for compliance checking for small DER systems (where the bulk of the issues are occurring).

As a result, compliance checks tend to be reactive and *ad-hoc* for these systems. In theory, DNSPs could request additional funding via the regulatory process to fund compliance checks where it can be shown that identification and rectification of issues is in the long-term interests of consumers. However, no DNSP has attempted this to date.

Compliance and enforcement

Network connections standards directly impose obligations on the owner of the DER system via the connection agreement.

Depending on the size of the connection, compliance with DNSP network connection standards can require:

- Testing and commissioning plans to be produced for sign off by the DNSP prior to finalising the connection agreement
- Testing and commissioning acceptance sign off by a DNSP-approved suitably qualified person
- Testing and commissioning acceptance witnessed by the DNSP.

How the DNSP responds to non-complying DER systems may be set out within their network connection standard and can involve:

- Issuing notices of non-compliance to the proponent
- Disconnection of the DER inverter from the electricity grid.

In reality, disconnection does not occur unless it is a safety-related issue (in which case the safety regulator would become involved).

Stakeholder views

Some stakeholders, particularly customer representatives and DER proponents, expressed strong views that the lack of consistency between DNSP connection standards is creating challenges for DER manufacturers and potentially leading to non-compliance. While these stakeholders accepted that DNSPs have a need for differing requirements in some circumstances, there are also many opportunities to streamline technical requirements.

> *"Variations in rules mean that manufacturers have to supply for every variation and we need to rely installers to make sure settings are correct for the time and place of installation… Someone needs to ensure that DNSPs get their act together. ENA hasn't been able to. The voluntary approach has been tried for years and has failed, so a mandatory, regulatory response is needed."*
> *(Industry stakeholder)*

These same stakeholders were also critical of the lack of transparency in the development of network connection standards, including large variations between DNSPs in terms of the way in which they consult with affected stakeholders. It was also reported that network connection standards are not always easy to access and in some cases are not published at the level of detail required in order for DER proponents to fully understand compliance obligations.

> *"Consistency across jurisdictions is important to reduce compliance and hence consumer costs. They do however need to be flexible and able to change rapidly due to how quickly the technology is evolving."*
> *(New technology stakeholder)*

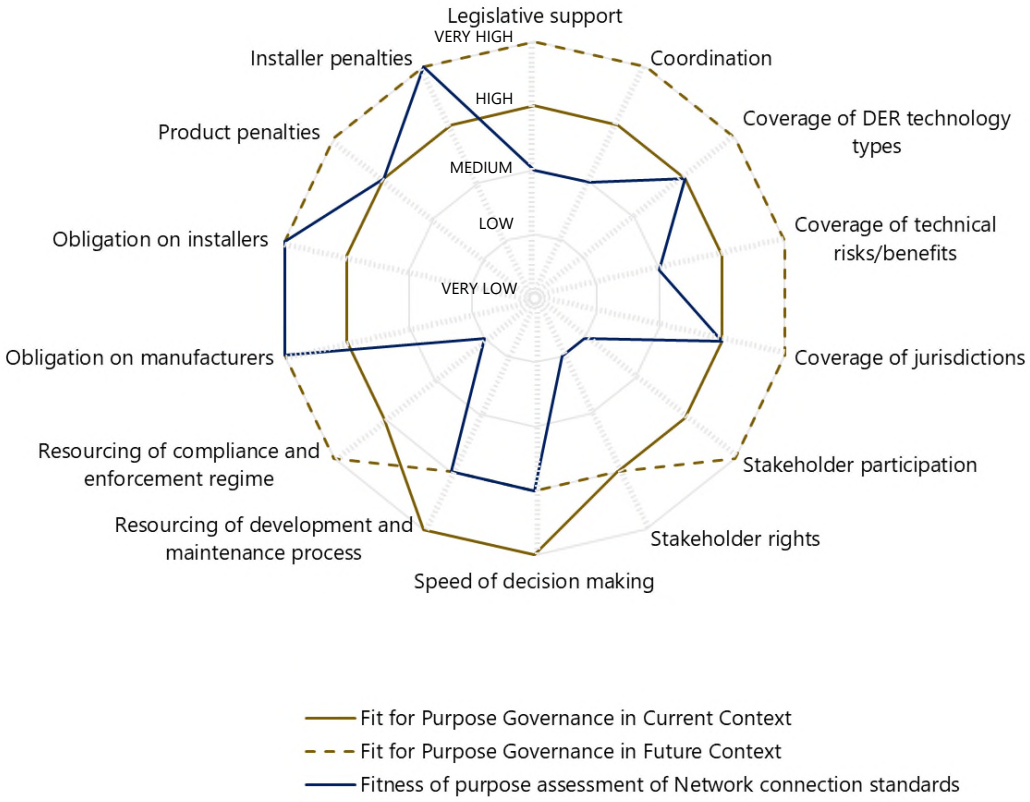
DNSP stakeholders had differing views in terms of the level of consistency that could be achieved over time. Most DNSP stakeholders acknowledged that there are at least some opportunities for improvement. NSPs also had varying views on the effectiveness of the ENA DER technical grid connections guidelines in driving consistency. Some NSPs held the view that greater consistency could be achieved by more widescale adoption of the guidelines, but that the guidelines need to be iterated over time. This is currently not the intention of the ENA.

> *"We believe that there should be national consistency as far as practicable. Having recently transitioned standards into the ENA guidelines, we are aware that choices had to be made between being nationally consistent and providing reduced options for customers; potentially increasing costs to DER customers; and avoiding uneconomic consequences for the Distribution Networks which could increase costs for non-DER customers."*
> *(Network stakeholder)*

Fitness for purpose assessment

The assessment below relates to the adoption of network connection standards.

Figure 21: Fitness for purpose assessment of network connection standards



The key benefits of network connection standards is their ability to impart obligations on both manufacturers and installers via the connection agreement. Network connection standards are also able to be updated relatively quickly in theory due to the limited number of stakeholders required to be consulted and the approvals process being mostly limited to the network business itself.

The key weakness of network connection standards is the lack coordination of standards across the 14 Australian DNSPs. A further weakness is in the level of stakeholder participation in their development. While some DNSPs have made efforts to include consultation in the development of their connection standards, the extent of consultation across DNSPs is varied and not required under any legislation or regulation. Where there is a lack of broader stakeholder input, there is the potential for the customer impacts to be not fully considered in the development of technical standards.

A further weakness is in the lack of resourcing of the compliance and enforcement regime, especially for small scale systems (<30 kW) which is anecdotally leading to a material quantity of non-compliant systems for inverter settings.

3.2.3 State and Territory-based electrical safety regulation

Description

The electrical safety standards that are developed, maintained and administered by each Australian State and Territory.

Structure

Electrical safety standards are developed, maintained and regulated separately by each of the Australian State and Territory regulators.

In general, each jurisdiction has its own electrical safety Act which:

- Establishes and enforces appropriate standards of safety in the electricity supply industry
- Establishes and enforces appropriate safety standards for electrical installations and electricity infrastructure
- Establishes a safety regulator with the authority to enforce the requirements of the legislation and its associated regulations.

For the regulation of products, all State and Territory jurisdictions can mandate safety standards, issue warning notices and effect a ban on, or recall, unsafe products. References to Australian standards throughout jurisdictional legislation ensures that technical information and requirements are current and consistent. Although jurisdictional regulators cannot change standards outright, they can influence Standards Australia development processes via representation on respective committees.

All State and Territory jurisdictions also adopt licensing arrangements requiring electrical contractors to be accredited and to obtain a certificate of compliance for each electrical installation. The standards the installer must comply with are set by each State and Territory, despite several initiatives to introduce uniform requirements via legislation. Current holders of a licence issued by an Australian State or Territory or New Zealand can apply for an electrical work licence in another jurisdiction on the basis of mutual recognition.

In Australia and New Zealand, Electrical Regulatory Authorities Council (ERAC)[42] is the recognised authoritative voice for electrical regulators, even though it has no executive powers. ERAC is responsible for coordinating the activities (i.e. regulatory strategies, policies and ongoing reforms) of jurisdictional regulators on a national level. ERAC consists of representatives from each regulatory authority with the aim to achieve acceptable levels of electrical safety, supply quality and energy use efficiency through cooperative action from each regulator.

Coverage

Electrical safety standards cover all DER types. The standards included within the state-based safety legislation and regulations are for the most part limited to safety risks with some variations by state. The Office of the Technical Regulator in South Australia has, for example,

[42] Electrical Regulatory Authorities Council, 2020, available from https://www.erac.gov.au/about-erac/who-we-are/

a legislated objective regulate both safety and non-safety technical related risks, whereas all other states and territories' safety regulators have legislated objectives limited to safety risks.

Notwithstanding, many of the technical standards set out in state-based safety regulations include non-safety related technical standards. The ability of state-based safety regulators to ensure compliance and enforcement with these standards is likely to be limited.

Standards development processes

The processes for developing safety-based standards vary by jurisdiction, but for the most part refer to formal Australian Standards contained within regulations. The process and responsibilities for developing and amending regulations is determined by the Act and each jurisdiction's own processes. Amending regulations can be relatively fast depending on the level of Ministerial support.

Resourcing

State-based safety regulators are resourced and often required by legislation to undertake monitoring and compliance activities via audits of electrical contractors' safe work policies, work procedures and electrical installations/works against the requirements of the Act. State-based safety regulators are resourced to undertake these audits in a targeted manner.

Compliance and enforcement

State regulators have powers to issue warning notices and effect a ban on or recall unsafe products which do not meet regulated safety standards[43]. Overall, there are varying degrees of pre-market (e.g. certification schemes) and post-market (e.g. inspections, audits) surveillance regulation processes and activities undertaken by regulators for electrical equipment.

These powers extend to safety-related standards only.

Stakeholder views

Stakeholders view the State and Territory-based regulators as having an important role to play in the governance of DER technical standards. Stakeholders, especially those with experience across multiple jurisdictions, expressed some frustration at the level of harmonisation between states and territories in terms of standards and processes. One stakeholder observed that the Productivity Commission has called for harmonisation of state and territory-based electrical safety regulation twice since 2006, but that this harmonisation is yet to occur.[44]

Some stakeholders expressed opinions that State-based regulators could take on a larger role in compliance and enforcement of technical standards, but recognised that this may require legislative change to enable coverage of non-safety related technical risks.

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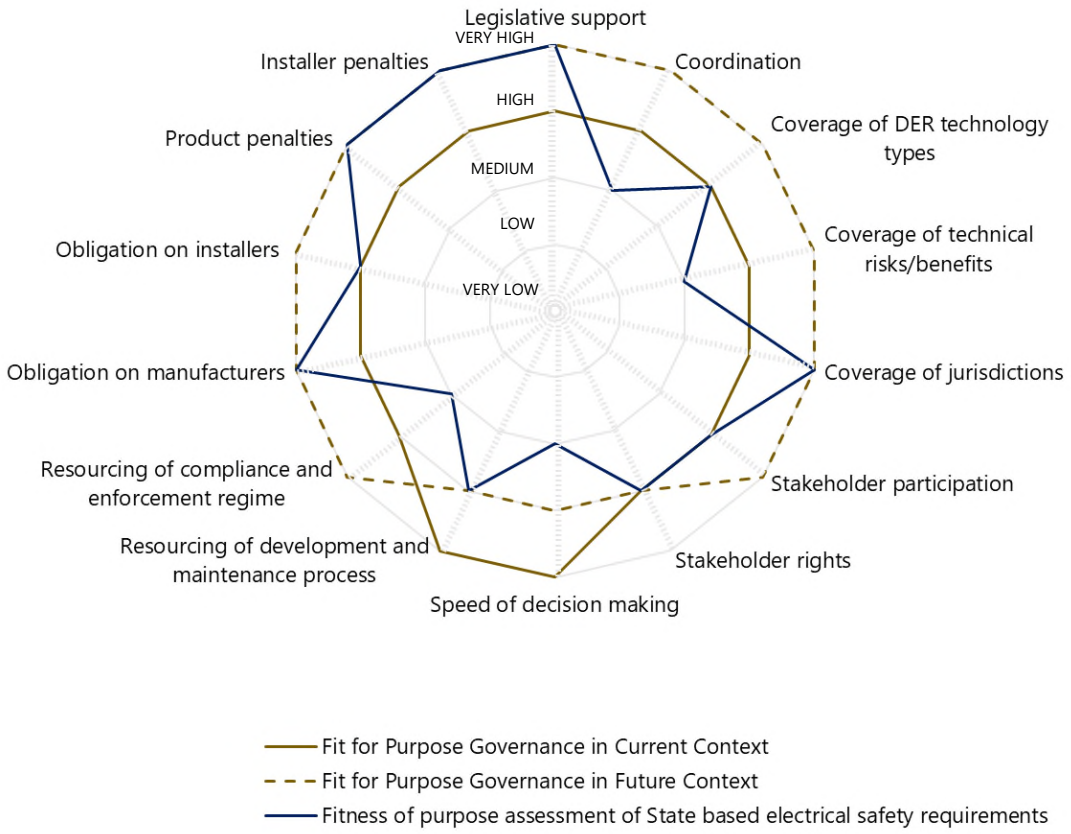
43 Electrical Regulatory Authorities Council, ERAC Recall Guidelines, Version 03 / December 2019 <https://www.erac.gov.au/wp-content/uploads/2019/12/ERAC_Recall_guidelines_V3_Dec2019.pdf>

44 See https://www.pc.gov.au/inquiries/completed/consumer-product-safety/report and https://www.pc.gov.au/inquiries/completed/consumer-law/report respectively

Fitness for purpose assessment

The assessment below relates to the adoption of State-based electrical safety regulation.

Figure 22: Fitness for purpose assessment of State-based safety regulation



The key strengths are the legislative support and product and installer penalties.

The penalties for non-compliance are heavily imposed and fit for purpose given the electrical safety risks that it aims to mitigate against. Similarly, although resourcing to undertake compliance and enforcement activities is generally undertaken across jurisdictional regulators, a far greater level of support and frequency is required in order to adequately mitigate the high severity of outcomes that electrical safety risks can cause.

The key weakness of State-based safety regulation is the lack of harmonisation between States and Territories and the inability, at least in most jurisdictions, for non-safety related technical risks to be considered. There may be opportunity for leveraging existing avenues (i.e. through ERAC) to coordinate efforts towards improving national consistency in electrical safety standards.

3.2.4 Commonwealth incentive/rebate scheme

Description

The primary Commonwealth incentive scheme for DER systems since 2001 is the Small-scale Renewable Energy Scheme (SRES)[45]. The SRES has been the primary mechanism facilitating compliance to DER technical standards for solar PV systems (and other small-scale renewable energy systems) in Australia over this time.

Structure

Formed under the Australian Renewable Energy Target (RET)[46], the SRES is administered by the Clean Energy Regulator (CER) and legislated through the Renewable Energy (Electricity) Regulations 2001[47] and Renewable Energy (Electricity) Act 2000[48]. The SRES provides a financial incentive for customers to install renewable energy systems where rebates are allocated (based on geographical location, installation date, and amount of electricity in MWh generated or displaced) in the form of STCs.

This scheme is available until 2030 and is largely coordinated across the Australian jurisdictions with close to 100% of eligible rooftop solar PV installations in Australia making use of the scheme.

The value of STCs will decline over time to 2030, such that at some time before 2030, the administrative costs of creating certificates will exceed the value of the certificates such that the number of solar PV (and other) systems creating certificates under the scheme will decline rapidly.

The Regulations also require that installers are accredited by the CEC and for inverter-based systems, that the system components are listed on CEC's approved equipment list.[49]

The CEC is responsible for managing the approved list. This, in effect, allows CEC to set the standards with which rooftop solar PV installations must comply.

Coverage

SRES covers renewable energy DER technologies that are capable of generating electricity or offsetting electricity consumption through the use of solar PV panels, wind turbines, hydro systems, solar water heaters, and air source heat pumps. The scheme requires, for example, AS 4777-compliant inverters.

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45 Clean Energy Regulator, Small-scale Renewable Energy Scheme, available from http://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/How-the-scheme-works/Small-scale-Renewable-Energy-Scheme

46 Renewable Energy Target, available from http://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target

47 Australian Government, Federal Register of Legislation, Renewable Energy (Electricity) Regulations 2001, available from https://www.legislation.gov.au/Details/F2017C00269

48 Australian Government, Federal Register of Legislation, Renewable Energy (Electricity) Act 2000, available from https://www.legislation.gov.au/Details/C2016C00624

49 Note that the CER is trialling a method of electronic verification that the actual installed PV panels in solar PV installations are compliance using barcode scanning. This electronic process speeds up certificate approval. The CER are examining extending the approach to inverters and other components.

The types of technical risks able to be considered within the setting of standards for the scheme are not limited and cover technical and safety risks for consumers and networks. To date the SRES has not actively addressed system security risks.

Standards development process

The technical standards with which systems installed under the SRES must comply are set out in the Renewable Energy (Electricity) Regulations 2001 and are developed via the Commonwealth Government processes for subordinate legislation.

CEC is also able to specify additional technical standards for inverter-based systems in order to be listed on their Tested and Approved inverter list.

Resourcing

The CER is resourced to undertake monitoring and compliance activities including inspections to randomly audit systems with STCs created against them and ensure scheme participants have installed a system that satisfies the SRES eligibility and installation requirements at date of installation.

Compliance and enforcement

There are no legislated requirements under the SRES unless the rebate is being claimed, in which case, the customers/installers are obligated to:

- Ensure the small-scale renewable energy system is approved and eligible under the small-scale renewable energy target, where panels and inverters are on the CEC list of approved components50, and solar water heaters are listed on the CER register of solar water heaters51
- Ensure that all parts of the small-scale renewable energy system are installed and capable of generating electricity or heating water, no more than 12 months prior to creation of STCs
- Meet Australian and New Zealand standards
- Use a CEC accredited designer and installer52, and meet the CEC design and install guidelines53
- Be classified as small-scale and meet specific electricity generation thresholds as per CER requirements for solar panel systems, wind systems, hydro systems, or for a solar water heater or air source heat pump

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50 CEC approved PV modules and inverters list, available from http://www.cleanenergyregulator.gov.au/RET/Forms-and-resources/Forms-and-resources-for-agents-and-installers#Clean-Energy-Council-approved-photovoltaic-modules-and-inverters-list

51 CER Register of solar water heaters, available from http://www.cleanenergyregulator.gov.au/RET/Scheme-participants-and-industry/Agents-and-installers/Small-scale-systems-eligible-for-certificates/Register-of-solar-water-heaters

52 CEC Accredited installers, available from https://www.cleanenergycouncil.org.au/industry/installers

53 CEC Accredited guidelines, available from https://www.cleanenergycouncil.org.au/industry/installers/compliance-toolkit/accreditation-guidelines

- Retain all documents relating to the installation for at least five years.

Auditing information is then used to prompt the installer to perform corrective actions if necessary and inform the level and quality of compliance under the scheme. There is also the potential for criminal charges via the Commonwealth Fraud Framework[54] where fraudulent claims with respect to compliance with the relevant technical standards are discovered.

Stakeholder views

Stakeholders had broadly positive views on the SRES in terms of its structure, processes and the outcomes it has delivered. Stakeholders also expressed views that the CEC currently plays an important role in maintaining registers of accredited products and installers and that this process is managed effectively.

> *"The Approved Installer and equipment approach (CEC-led) helps."*
> (Industry stakeholder)

Stakeholders expressed high levels of concern that there has not been sufficient planning as to how the governance of DER technical standards covered by the Scheme will transition to an alternative model as the Scheme winds up. That is, without an SRES there is no requirements for either installers or manufacturers to meet certain requirements other than what is incorporated within network connection arrangements and State-based safety standards. Stakeholders were also keen to understand what role the CEC is likely to play in any future governance.

> *"Need a Whole of grid, high level planning approach to looking what the future grid will look like and what it needs before full DER planning can be reasonably undertaken."*
> *(Research stakeholder)*

Fitness for purpose assessment

The assessment below relates to the adoption of SRES.

The current SRES has many strengths in governing the development, compliance and enforcement of technical standards for the technologies it covers. The obligations on both manufacturers and installers are high and the penalties for non-compliance are material on both installers and manufacturers, limiting their ability to participate in the Australian market. Decisions with respect to the inclusion of technical requirements can also occur relatively quickly either via changes to Regulation or made directly by CEC.

However, once the value of the certificates fall, and the Scheme is wound up, the obligations and penalties on both installers and manufacturers will drop to very low (non-existent) such that the SRES will no longer be an effective governance arrangement.

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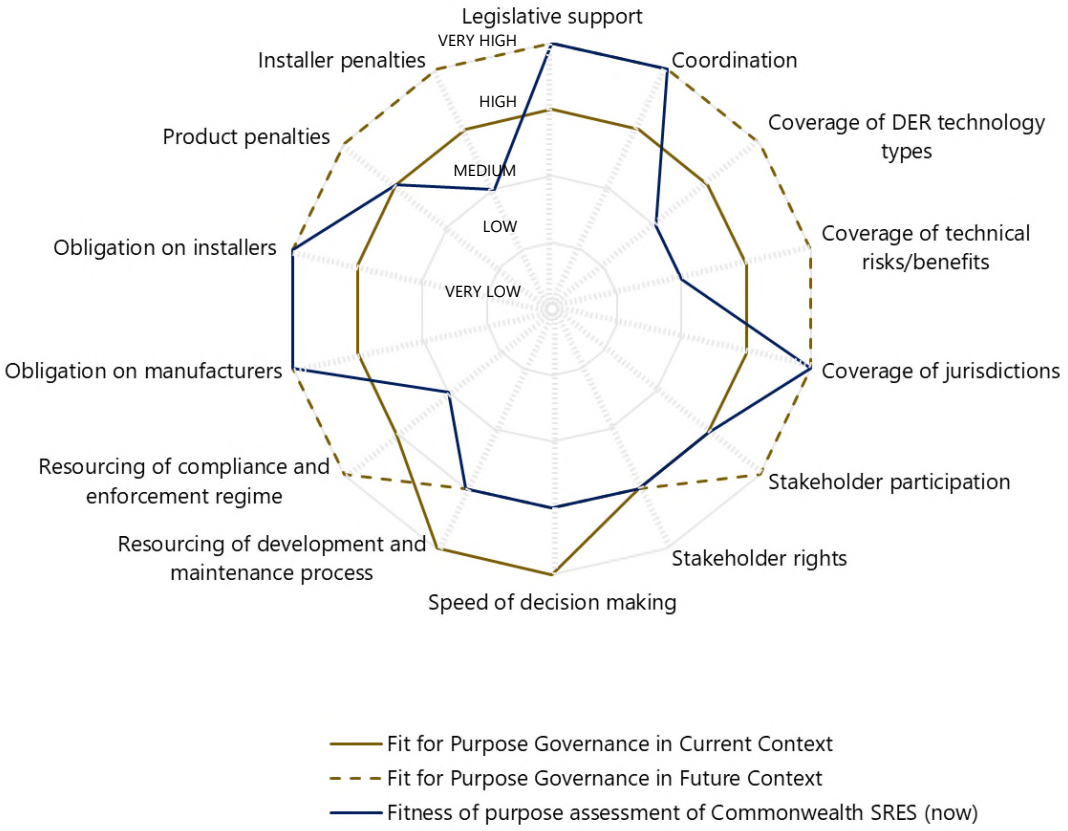
54 Australian Government Fraud frameworks, legislation and policies, available from https://www.ag.gov.au/Integrity/counter-fraud/fraud-australia/Pages/fraud-frameworks-legislation-policies.aspx

Figure 23: Fitness for purpose assessment of SRES (Current)



3.2.5 Commonwealth legislated technical standards (GEMS Act)

Description

The relevant form of Commonwealth legislation for governance of DER technical standards is the Greenhouse and Energy Minimum Standards (GEMS) Act 2012[55] delivered by the Equipment Energy Efficiency (E3) Program. The GEMS Act sets out mandatory minimum performance standards with respect to energy efficiency for electrical appliances.

Structure

The E3 program is a cross-jurisdictional program through which the Australian Government, States and Territories and the New Zealand Government collaborate to develop and monitor compliance with equipment energy efficiency performance and labelling standards.

The program is implemented by the COAG Energy Council. The GEMS Act is the underpinning legislation for the program.

The GEMS Act also establishes the GEMS Regulator who is responsible for administering and enforcing the legislation in Australia.

55 Energy Rating, Legislative frameworks, available from https://www.energyrating.gov.au/suppliers/legislation

Under the GEMS Act, a product that uses energy or affects the amount of energy used by another product and is in a product class covered by a GEMS determination, is known as a GEMS product. GEMS products can only be supplied or offered for supply, or used for commercial purposes, if they are registered with the GEMS Regulator.

Coverage

The program currently covers 22 different product types with other products currently under investigation but is currently limited to energy efficiency performance. A review of the GEMS Act published in August 2019, recommended that the Act be expanded to include demand response.

On 22 November 2019, the COAG Energy Council agreed to the introduction of demand response capability requirements for a number of products including air conditioners, electric storage water heaters (resistive), devices controlling swimming pool pump units and electric vehicle charger/discharger controllers[56,57]. The expansion of the scheme to demand response (rather than just energy efficiency) will require legislative change to the GEMS Act and will enable the GEMS Act to cover demand response from additional products (including battery storage).

Standards development processes

Recommendations with respect to DER technical standards are developed via the E3 program. The E3 program is managed by the COAG Energy Council's Energy Efficiency Advisory Team (EEAT), made up of representatives of Australian, State and Territory governments and the New Zealand Government. The EEAT recommends actions through the Senior Committee of Officials to the COAG Energy Council for decision.

COAG best practice regulation requirements apply to product determinations under the GEMS Act. Under the COAG requirements, a Regulation Impact Statement (RIS) is prepared for both a consultation stage and for decision stage containing cost benefit analysis and risk assessments. The best practice requirements also set out requirements for consulting effectively with affected key stakeholders at all stages of the regulatory cycle.

Resourcing

The GEMS Regulator is funded, at least in part, by the GEMS registration fees as set out in Greenhouse and Energy Minimum Standards (Registration Fees) Act 2012.

When a model of a GEMS product is registered, registrants are charged a registration fee to recover the costs of providing the registration and compliance monitoring services under the GEMS Act.

Registration fees are intended to cover the costs of:

- Processing registration applications

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56 Australian Government Regulation Impact Statement updates, available from https://ris.pmc.gov.au/2019/11/26/smart-demand-response-capabilities-selected-appliances

57 Energy Rating, Smart demand response decision Regulation Impact Statement approved, 2019, available from https://www.energyrating.gov.au/news/smart-demand-response-decision-ris-approved

- Compliance monitoring (including testing) in relation to models of GEMS products, for the purposes of the GEMS Act58.

Non-cost recoverable activities such as reporting functions, new determination developments, communications, and planning and resource management are not included in the fee calculations and are funded directly by the Commonwealth Government.

Compliance and enforcement

The GEMS Act provides the GEMS Regulator with a range of response options[59] including informal educative approaches, administrative and civil actions, and criminal sanctions.

GEMS Regulator responses include:

- Suspending a registration
- Cancelling a registration
- Enforceable undertakings
- Infringement notices
- Civil penalty order
- Injunctions.

The GEMS Act also allows the GEMS Regulator to publicise details of enforcement actions taken, including the names of persons in relation to whom the action has been taken against. In addition, certain adverse decisions relating to the registration of models of GEMS products may be publicised, including the names of registrants.

Stakeholder views

Only a small subsection of the stakeholders interviewed had views on the current GEMS Act/E3 program and its current and future potential application to DER.

Stakeholders with direct experience with the GEMS Act were somewhat wary of its broader application given that it currently sits somewhat "uncomfortably" outside other existing processes for DER standards development, compliance and enforcement.

Fitness for purpose assessment

The assessment below relates to the adoption of the GEMS Act.

The strengths of the GEMS Act are its legislative support and stakeholder participation.

The key weaknesses are in its coverage of technologies and technical risks which would require amendments in legislation to expand.

The penalties for installation non-compliance are not fit for purpose, being relatively light especially when compared to those applied to non-compliance of safety-based standards. While current resourcing of monitoring and compliance activities may be fit for purpose for

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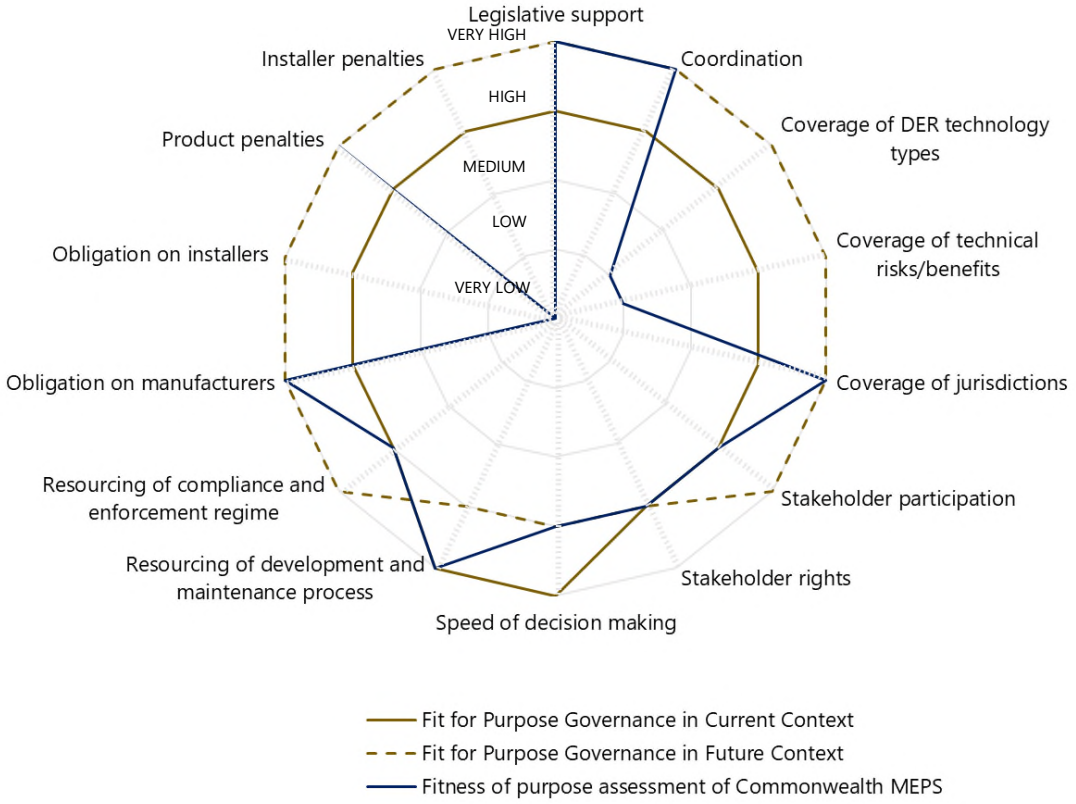
58 GEMS Fees Review 2016-17 Consultation

59 Energy Rating, Compliance framework, available from https://www.energyrating.gov.au/suppliers/compliance/compliance-policy

energy efficiency standards (with low risk levels), where applied to demand response standards the technical risks will increase, requiring a greater level of monitoring and compliance activities.

Figure 24: Fitness for purpose assessment of GEMS Act



3.2.6 State and Territory-based rebates/incentives/low interest loan schemes

Description

There are a number of current State-based rebates, incentives and low interest loan schemes for DER systems which specify technical standards with which the installation must comply in order to be eligible. These include:

- Victorian Solar Homes Program
- South Australian Battery Scheme
- Queensland Interest Free Loans for Solar and Storage
- New South Wales Empowering Homes Program
- ACT Next Generation Storage Program
- ACT Solar for Low Income Households Program.

Structure

The various schemes are generally not underpinned by legislation, but rather administered as programs by various State and Territory government departments responsible for delivering on energy and/or environmental policy objectives.

The technical standards required in order for the DER owner to be eligible to receive the rebate, incentive or low interest loan usually forms part of the contractual agreement between the DER owner and the government.

While the various schemes have many differences in design, there is some effort to coordinate the technical standards development and product accreditation processes at least across South Australia, Victoria and New South Wales via an established working group.

Coverage

The various schemes differ in terms of the DER technologies covered including various combinations of solar PV, batteries, solar hot water heaters and energy efficient appliances.

The DER technical standards set as part of the state-based schemes can be set at a higher level than would otherwise be required under the network connection standards and that required under State and Commonwealth safety and efficiency legislation. For example, both South Australia and Victoria require battery storage systems to be "VPP capable" requiring communication capabilities which are not generally required by the relevant networks.

Standards development processes

The technical standards are set via varying process but usually involve consultation with industry as well as input by various technical experts. Some states (such as Victoria) have undertaken detailed standards development process, setting requirements in the current context and signalling future requirements via a Notice to Market.

Other schemes tend to adopt requirements from either the SRES or other state-based incentive schemes.

Working groups comprised of representatives from state government departments in New South Wales, South Australia, Victoria and Queensland (and the ACT) meet quarterly in order to better coordinate their schemes including harmonisation of DER technical standards as well as coordination of product accreditation processes.

Resourcing

Resourcing of the various programs differ by state depending on the level of effort required in developing DER technical standards and undertaking compliance and enforcement activities.

Compliance and enforcement

Compliance and enforcement activities are also different in each state. Victoria and South Australia share a common accredited product register, which is managed by the CEC. South Australia engages a consultant to verify manufacturers claims.

The inspection regimes vary widely with some schemes adopting no monitoring, inspections or audits while other schemes (such as the Queensland Interest Free Loans for Solar and Storage) are adopting targeted inspections. The Queensland Government also delivers training processes for installers to comply with the scheme.

Stakeholder views

State-based incentive schemes are currently critical in ensuring compliance with best practice Australian and international standards which may otherwise be voluntary.

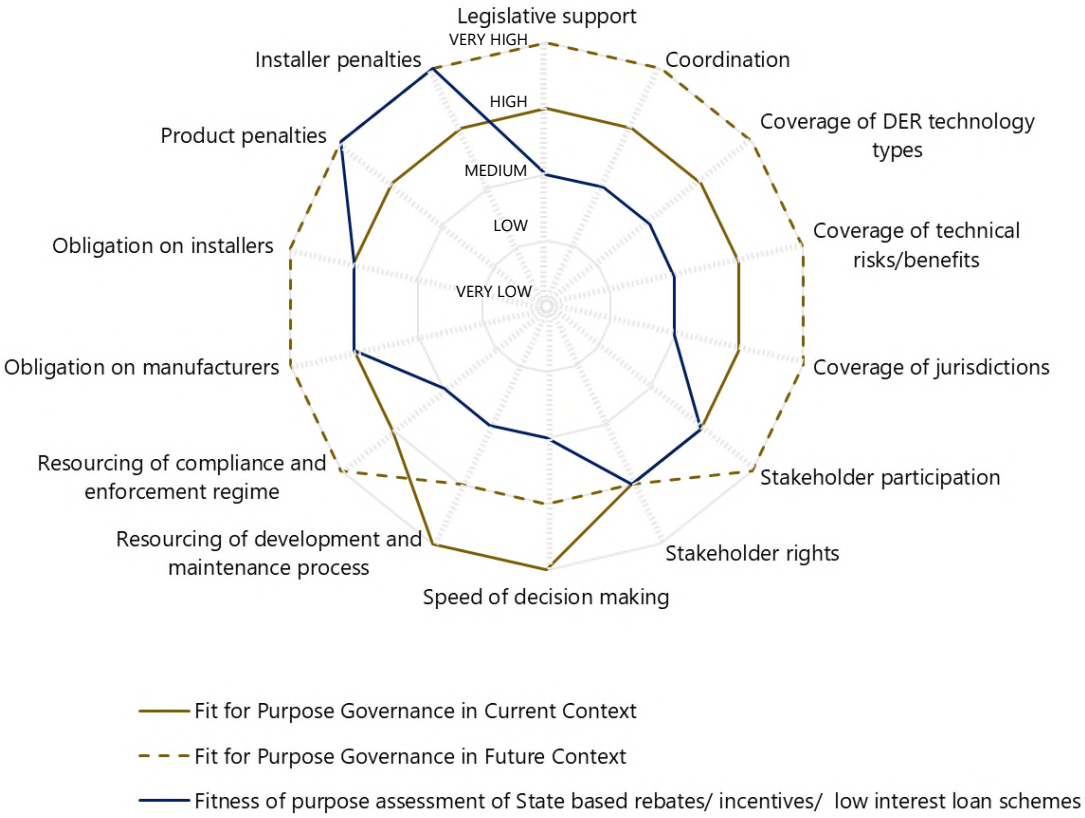
Where a DER requirement is not backed by a rebate (e.g. battery installations) there is little to no incentive for installers to comply with the network connection process or technical requirements.

However, some stakeholders were critical of the state governments attempting to innovate too early, especially with respect to VPP capable requirements prior to an industry agreed cyber security standard being in place.

Fitness for purpose assessment

The assessment below relates to the adoption of State based rebates/incentives/low interest loan schemes.

Figure 25: Fitness for purpose assessment of State based rebates/incentives/low interest loans



The state and territory-based schemes have strengths in governing the development, compliance and enforcement of technical standards for the technologies it covers, although this varies by state. The obligations on manufacturers are high and the penalties for non-compliance are material for both installers and manufacturers which can limit the ability for DER owners to access the rebate. Decisions with respect to the inclusion of technical requirements can also occur relatively quickly without the need for regulatory change.

The key weakness is in the lack of consistency, for example with respect to decisions around VPP capable battery storage requirements.

3.2.7 Market Participation

The existence of a market, in which DER systems may participate, is an opportunity to establish DER technical requirements such that market participation is contingent upon meeting certain standards.

While VPPs are beginning to emerge in Australia, these are currently limited to trial basis. There is currently no formal governance model in place to support the development of DER technical standards for any coordinated VPP market.

Notwithstanding, AEMO has developed a set of requirements for DER systems providing Frequency Control Ancillary Services (FCAS) into in the NEM under VPP Demonstration projects. These requirements set the metering and telemetry arrangements that would be manageable within VPP arrangements, but have sufficient capability to meet the need to verify fast FCAS delivery by aggregated DER. While these requirements apply to current demonstration projects, it is not clear how they would transition to a fully operational market.[60]

Stakeholders expressed views that while there is substantial work underway to identify, develop and refine appropriate communication, cyber security and control standards, none of the work is happening inside a formal governance model. For those stakeholders delivering this work, there is a critical concern that it has no clear vehicle for implementation.

3.3 Summary

All the governance arrangements described above have gaps and weaknesses when assessed individually. Furthermore, when considered in aggregate, the individual governance arrangements, rather than being complementary:

- Give rise to coordination and harmonisation issues
- Have gaps in terms of coverage of technologies and technical risk
- Have gaps in terms of adequate resourcing
- In some cases, deliver inefficiencies where multiple entities have responsibility for ensuring compliance with technical standards for the same DER systems.

The most critical gaps and weaknesses are:

- An overall lack of leadership and coordination and clear objective as to how DER technical standards should be governed
- Inability to implement technical standards related to emerging system security challenges - none of the governance arrangements (other than Australian and International Standards) currently enable AEMO to impose technical standards for managing system security risks

[60] It is not clear whether AEMO could continue to produce a guideline document, how this would be made mandatory or whether a Rule Change would be required.

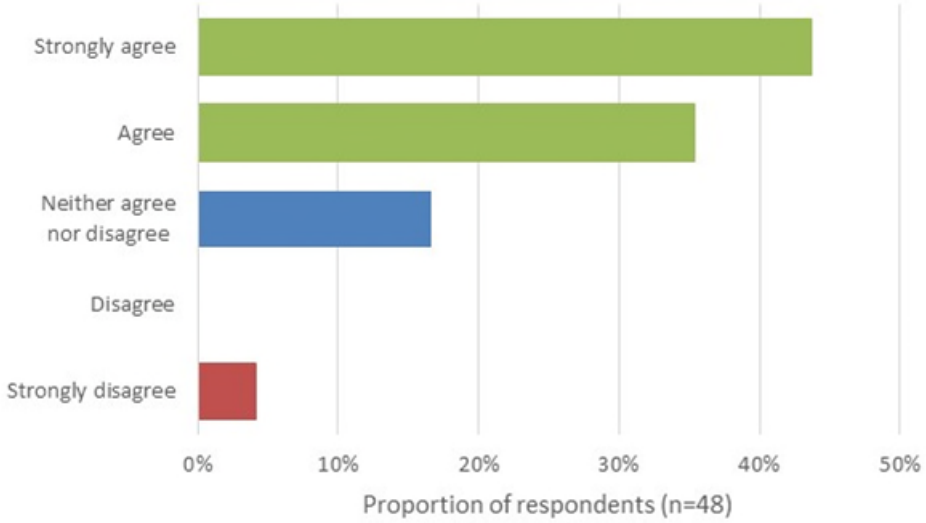
- The Standards Australia process which, in some stakeholders' views is too slow and not sufficiently transparent, does not enable participation from a broad range of stakeholder groups (especially customer groups) and decision making is not explicitly aligned with NEO
- Lack of harmonisation in network connection standards across DNSPs in terms of both decision-making processes and the technical standards themselves
- The lack of planning in terms of how the broadly successful processes adopted by the CEC and CER under the SRES will transition as the SRES is wound down
- Under resourcing of compliance and enforcement activities, and gaps especially for non-safety related standards
- Lack of coverage of existing governance arrangements to electric vehicle technology, potentially leaving the industry exposed to technical risks at network and system level, should penetration increase rapidly.

4. Consultation themes

4.1 Desire for change

The final question in the survey sought to test the appetite for change: *Do you consider there is a case for changing the governance of DER technical standards to align with the needs of the current and future DER product and energy services markets?* Figure 26 shows the survey results – 79 percent of respondents agree or strongly agree that there is a case for change.

Figure 26 A case for change – survey response



4.2 Major themes

This section provides an overview of the key themes that have emerged through consultations:

1. The scale, complexity and speed of change – this requires agile, adaptive regulation
2. The current lack of leadership and coordination
3. Recognise existing strengths and address weaknesses
4. The significance and current weakness of in the point of installation in the compliance regime
5. The scale of cultural change required.

4.2.1 Plan for radically altered electricity system

The first theme is to recognise that scale, complexity and speed of change means that planning now needs to envision a radically altered electricity system and the challenges this poses for both industry and regulation.

"DER uptake is fast, DER Technical Standards are slow."
(Industry stakeholder)

"In 5-10 years' time, DER standards and markets will have developed significantly, but the technology will have moved forward massively, business models will have evolved, technology uptake will have increased significantly, and customer expectations will also have shifted."
(Network stakeholder)

"The uptake of EV will have an enormous impact in 5-10 years."
(Industry stakeholder)

"We need a shared solution model for "markets" which clearly defines the roles and responsibilities of various involved parties: DER owners, DER vendors/operators, VPP operators, NSPs, and market operators."
(Industry stakeholder)

This altered environment presents novel challenges, such as:

- The "sleeping giant" challenge of transferring transport energy requirements from liquid fuels to electricity as the fleet switches to electric vehicles and the need to get ahead of that change
- The increasing risks to system security corresponding to the larger proportion of total energy services delivered, and the current absence of a mechanism for AEMO to promote technical requirements to manage that system security risk
- The spill over into ICT standards and requirements and the risk to physical security of the power system due to ICT risks including, but not limited to:
  - Cybersecurity risks as a barrier to implementing communications standards, and
  - Device data storage, analysis and potential device control from internationally based data clouds.

This planning environment requires *adaptive regulation* that enables iterative change implementing technical standards that suit now and can be reviewed and changed in 12 months' time.[61]

"The rapid pace of change in internet and communications technologies requires more flexible and nimble instruments to govern minimum technical specifications. While the Australian Standards process and governance regime is suitable for product specifications that change over multiple years, the 2 to 3-year process and consensus based decision model may not be fit for purpose in the dynamically changing domains of system interoperability and communications or where there are cybersecurity or power security risks to the electricity network. Detailed

[61] Adaptive regulation is a topic in public sector theory that recognises that *ex ante* regulation is difficult if not impossible to design for a dynamic environment, for example the Internet, while at the same time there is strong interdependence among participants on multi-sided markets that are experiencing rapid technological and economic change. With a more realistic view of the strengths and weaknesses of markets and regulation, adaptive regulation can be experimental, making incremental and flexible changes within an accountable framework to be responsive to the changing context while sustaining the goal of regulation.

technical requirements need to sit in subordinate instruments so that these can evolve with technical and system changes."
(Market body stakeholder)

4.2.2 Leadership and coordination

There is a vacuum in the leadership and a lack of coordination in the sector in general and with regard to the governance of DER technical standards in particular.[62]

"The sector is crying out for coordination."
(Industry stakeholder)

"Anything more nimble is good because stakeholders are 'so distributed.'"
(Government stakeholder)

"Australia is full of smart people, the energy sector is "switched on", there are lots of opinions but no leadership, COAG needs to provide leadership."
(Industry stakeholder)

"Governance standards are fragmented and there is no clear future path. This makes it difficult to build systems."
(New technology stakeholder)

"Consistency across jurisdictions is important to reduce compliance and hence consumer costs."
(New technology stakeholder)

"We have three bodies (4 if CER is included) when only one is needed."
(Industry stakeholder)

"There is no doubt that we need a single national regime for all technical regulation of things connected to the grid, and for safety regulation. There is also no doubt that the industry should build its own Approved Standards Development Organisation."
(Consumer stakeholder)

"Establishing a single, funded, nation-wide entity tasked with developing such standards, with a clear deadline for completion. A second auditing or compliance testing body would be useful."
(Research stakeholder)

Without leadership and a stocktake of current governance activities there is no roadmap for the development of DER technical standards, therefore uncertainty for industry and proponents and delays in investments and innovations.[63] Individuals and organisations do not have a "line of sight" between their own activities and collective objectives.

There is no formal coordination between the different governance arrangements in terms of an overall objective or roadmap for the development and adoption of DER technical standards.

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62 Leadership in the electricity sector includes the proclamation or mandate from COAG Energy Council for sector leadership and for stakeholders to become champions.

63 This high level review has considered the general characteristics of current arrangements in section 3, but it is not a detailed survey of all DER technical standards and corresponding governance processes.

The variation in DNSP connection requirements and variation from ENA guidelines are a specific example cited.

> *"DNSPs should work together for greater alignment in standards and settings, utilising the ENA guidelines. There is opportunity to look to align service and installation manuals as a next step."*
> *(Network stakeholder)*

> *"Although in general the makeup of the distribution network are similar in nature the varying types of components with differing specifications have been used that impact the hosting capability. Investment decisions 10 year ago have economic lifespan of at least 30 years remaining… So standards needs to be rigorous in definition and also allow for variability in settings to allow balance between cost borne by individuals and cost borne by the whole industry."*
> *(Network stakeholder)*

There is no ability to proclaim an existing qualified working group as a topic 'owner' authorised to develop appropriate technical specifications with a destination/process to then become national standards.

It was noted by some that various bodies and processes have attempted to fill this gap, but ultimately are champions for those particular concerns or networks of organisations that motivate their activity, and they step back due to lack of authority, lack of ongoing funding or refocus on their core interest.

Most stakeholders expressed some view about the difficulty to maintain current knowledge at both individual and organisational levels. Improving the collation, storage, distribution and education of information about DER technical standards is a much needed coordination activity.

> *"It is such a complex landscape, (even) I can't keep up!"*
> *(Government stakeholder)*

> *"Just engaging with all that is going requires a (full time) staff"*
> *(Government stakeholder)*

> *"How are installers in the field going to do the right thing if they cannot find the (network) connection requirements? We need a single landing page."*
> *(Industry stakeholder)*

> *"One central web page where there is information about relevant DER standards and MOST IMPORTANTLY a central repository for grid connection rules."*
> *(Industry stakeholder)*

> *"An inventory of what (proprietary as well as non-proprietary) DER standards are available and in use in A/NZ and which product suppliers, energy and DR service providers and jurisdictions have adopted them."*
> *(Industry stakeholder)*

> *"How can we expect thousands of electrical installers to read thousands of pages of Standards? They need a cookbook style guide."*
> *(Government stakeholder)*

4.2.3 Recognise strengths and address weaknesses

Stakeholders told the review that parties, especially resource constrained parties, will prioritise their engagement in governance processes with comprehensible and predictable process (how contributions influence decisions) that display characteristics of independence, transparency (how stakeholder input leads to outcomes) and sufficient resourcing. Parallel governance arrangements can display all, some or none of these characteristics – they need to be more consistent across governance arrangements.

> *"Standard development is a voluntary activity. Very few companies are able to afford to allocate people to being involved. So the process has dominated by DNSPs and one or two large companies. DER standards are a public good. While the electricity system is going through a period of rapid change there should be resourcing - either taxpayer funded or maybe from fees levied on electricity market participants."*
> *(Industry stakeholder)*

> *"Gross lack of consumer perspective and presence in these processes. The lack of resourcing for this means it's very hard to get involved and stay involved for potentially very long and detailed development processes. Therefore development is too often led by industry who can afford to resource it (but also have financial incentive to develop standards to suit themselves)."*
> *(Consumer stakeholder)*

There are mixed opinions about Standards Australia's processes for the development of Australian Standards.

- On the one hand the process is highly respected for the achievement of consensus stakeholders, with acknowledgement of certain parameters, especially the time taken for consultation to seek consensus.
- On the other hand, there are a range of criticisms about its suitability as a mechanism for effective *adaptive regulation* in a highly dynamic environment, such as:
  - The speed of decision making
  - The transparency of the rationale for decisions made
  - The appropriateness of technical membership given a particular topic
  - The lack of clear objectives that are aligned with the NEO, notwithstanding Standards Australia's broader remit.

Few stakeholders appear to be aware of the range and flexibility in Standards Australia's products and processes, such as the faster process to develop an ATS or the process to adopt an international standard.

Similarly, there are mixed opinions of the efficacy of the ENA/DNSPs efforts developing and implementing a national guideline for connection requirements.

> *"Participation of stakeholders in the A/NZ standards processes is a strength."*
> *(Industry stakeholder)*

> *"Decisions are made by those who turn up. Large utilities, public sector (regulators, safety bodies, policy areas etc) and large companies can and do fund*

participation at all levels. Industry bodies, consumer groups etc rely upon volunteers. Not only is there massive financial advantages for incumbents there is huge information asymmetry and analysis and modelling capabilities imbalance."
(Industry stakeholder)

"Standards development is largely transparent and industry-led, with broad stakeholder engagement and participation."
(Industry stakeholder)

"In particular, we would support improved governance arrangements to ensure that Committee debate and decision remain technical, customer focused and evidence-based. In some instances, this may entail appropriate resourcing to enable Committees to commission appropriate independent technical modelling and cost benefit analysis to assess the appropriateness of proposed solutions."
(Retail stakeholder)

"Providing Standards Australia with funding to allocate to members of Review Committees to intensively develop standards (ie. 3x 1 week in-person commitments for all members of the committee), with additional funding for the Lead Drafting Organisation"
(Government stakeholder)

"Standards Australia should be properly resourced to manage the pace and extent of changes. It needs to be a consultative process to ensure stakeholder interests and issues are fully addressed. That takes time. The current process is highly dependent on voluntary input from industry. This is not valued and resourcing is hard to secure for regulated businesses."
(Industry stakeholder)

4.2.4 Compliance challenges

"Any incorrectly installed equipment is not benign."
(Government stakeholder)

"No requirement for validation of installed DER design, settings, or performance. The CEC runs a small number of audits, and DNSPs only respond when they identify that the DER is causing a network problem. Where a DER requirement is not backed by a rebate (e.g. battery installations) there is little to no incentive for installers to comply with the network connection process or technical requirements."
(Network stakeholder)

"Inadequacies in the installation space which focus on compliance with physical installation but less so with compliance with inverter settings and adherence to network operator requirements."
(Network stakeholder)

Compliance is a prominent and complex issue. The responsibilities for compliance are fragmented across:

- Two separate regulatory domains
- Products versus installer (installations)
- Technical performance versus safety risks

In addition to the above, responsibilities are generally also under resourced.

Product compliance versus installation compliance

As a general characterisation, compliance along the DER supply chain involves verification that DER products imported and/or sold in Australia comply with product standards and verification that the installation of an electrical product on site (behind the meter) complies with installation safety standards.

> *"An emerging issue in the residential/SME DER space which negatively impacts advances in standards and technical connection requirements is the capability and technical comprehension in the installer workforce. There are too many instances of inverters being programmed with the wrong settings or not being programmed at all, or worse, being deliberately programmed to avoid call back enquiries. Any advances in standards that support more efficient utilisation of DER to support network optimisation can be undermined by inappropriate installation / commissioning of DER."*
> *(Network stakeholder)*

There is common stakeholder agreement that DER installers/installation regulators are the weak link – ensuring compliance of installations is necessarily "on the ground, local".

- What motivates Certificate III trained installers, even CEC accredited, "to read 1000 pages of standards that costs thousands of dollars?"
- When it is so hard to find DNSP connection information – what motivates installers to make the effort to do so?
- Who has legal authority and mandate to inspect installations for compliance (at the boundary between two regulatory domains)?
- Safety regulators have the systems and inspectors in the field, but what legal motivation do they have to verify DER device settings?

Part of the historic response has been to shift what can be into the product specification, such as pre-configured options from which to choose, as that gets captured by the 'approved product' process.

On the one hand, the current CEC approved product list and installer accreditation list are well regarded and perceived as effectively supporting the incentive-led compliance under the SRES scheme. On the other hand, while currently solar installations go through this process, what happens in a "post-SRES" environment that effectively begins as the value of certificates declines.

- Who maintains approved product list?
- Who maintains accredited installer list?
- What are they accredited to?
- What will be the incentive for installers to comply?

Furthermore, the verification of compliance of a DER installation at the time of installation does not address the problem of compliance five or ten years later – including to what standard would compliance be checked, and how would compliance be verified? A possible

solution for communicating equipment is machine reporting in response to an authorised query, however this does not address the legacy fleet of DER.

4.2.5 Recognise the need for culture change

A significant part of the problem of governance of DER technical standards is the need for a change in culture that challenges business as usual for most of stakeholders, and ultimately requires change of the legal framework.

This is because a vision of decentralised machinery that contribute a substantial fraction of the power system generation requires a corresponding large fraction of "decentralisation of responsibility":

- Some of that decentralisation of responsibility is to the safety regulators as the "feet on the ground"
- Some is to installers – they are part of the team building the distributed machine that will replace existing generators
- Some is to the asset owner – the owner and operator of that distributed machine.

In this way, the rise of the "prosumer" more significant in power system and market terms than the "gentailer", with:

- Impact on performance of power system
- Impact on performance of energy and associated markets
- Impact on electrical technician workforce capabilities and responsibilities
- Impact on regulatory and policy workforce
- Concomitant changes in training, networks and ongoing education
- Changing responsibilities of prosumers corresponding to change in role from consumer.

The role of each of these stakeholder groups will have to evolve, requiring technical and legal clarification, effective communication and education with large communities in each of these group, all in alignment with a single national vision.

This will require the energy sector leadership and the champions of DER technology across the supply chain and across the power system to challenge and change the cultural attitude towards DER both within their own communities and across the larger community. They will need to lead cultural discussions in what are the distributed responsibilities of parties participating in the construction of this distributed machine, and direct that discussion into the regulatory changes required to effect these changes in responsibilities.

5. Comparative systems

In addition to the analysis of the variety of governance arrangements currently in place in Australia for DER technical standards, the review conducted a scan of similar systems for governance of technical standards that provide exemplars for possible future DER technical standards governance in Australia. Five systems are described including three international case studies in the electricity sector and two Australian case studies in water and telecommunications sectors:

- Case study 1: Standardisation in Germany
- Case study 2: Hawaii
- Case study 3: Telecommunications industry in Australia
- Case study 4: Consumer Data Standards Australia
- Case study 5: ACCC rural water rights.

5.1 Energy sector standards

Case study 1: Standardisation in Germany

In Germany, standardisation is self-regulated by industry through the national non-profit organisation; the German Commission for Electrical, Electronic & Information Technologies (DKE)[64]. DKE is a joint organisation comprising of the German Institute for Standardisation (DIN) and the Association for Electrical, Electronic and Information Technologies (VDE); responsible for creating and maintaining standards and safety specifications in relation to the areas of electrical, electronics, and information technologies.

In the European and international bodies responsible for standardisation, Germany's interests are represented by DKE.

The DIN standards produced from the collaboration between these bodies require full consensus and involvement from all stakeholders; and although they are voluntary, they can be mandated through contracts, laws or regulations. Evidence of compliance to the standards by standards users can be obtained for products or services via DIN's subsidiaries that offer certification services. For end users, product manufacturers can declare compliance to all legal requirements through applying the CE certification markings[65] for products sold within the European Economic Area.

Similarly, DIN certification markings with unique registration numbers are used to demonstrate compliance of a product, service or process with DIN, DIN EN or DIN EN ISO

[64] DKE German Commission for Electrical, Electronic & Information Technologies of DIN and VDE, available from https://www.din.de/en/getting-involved/standards-committees/dke

[65] VDE Testing and Certification, available from https://www.vde.com/tic-en/marks-and-zertificates/certification-marks-and-attestations

standards. The German Committee of Standards Users (ANP) provide means for a platform to exchange experiences and information for all stakeholders involved in standardisation[66].

Case study 2: Hawaii

The Hawaiian Public Utilities Commission (HPUC) established the Reliability Standards Working Group (RSWG) in 2010 to set fact-based standards, metrics, rules, criteria and processes to be adopted by Hawaiian Electricity Companies' island grids in an effort to increase use of renewable energy without compromising grid reliability[67]. While the working group was looking across all forms of renewable energy (not just DER), the processes are relevant due to the policy change which required a rapid response from technical standards to ensure that the policy is delivered without compromising reliability.

Critical to meeting timeframes was the establishment of a dedicated, temporary working group which operated from July 2011 to January 2013. RSWG comprised 25 entities plus observers who actively contribute and vote, including utilities, state counties, state agencies, generators and advocates (consumer and environmental).

The independent facilitator, in its review of the working group, cited the following factors as critical to success:

- Strict participation and voting rules
- Consensus required, or where dissenting, rationale had to be set out in terms of public interest
- Protective order to cover proprietary data which enable data and analysis underpinning standards to be shared across the working group
- Subgroups to develop recommendations for sets of issues to the group,
- Tight timelines
- Process courtesies and efficiencies.

5.2 Communication and other sectors

Case study 3: Telecommunications industry in Australia

All technical standards for the wired and wireless communications and media infrastructure and services under the telecommunications sector in Australia is governed by the Australian Communications and Media Authority (ACMA) under Commonwealth legislation[68]. A register of related industry codes and standards that ACMA maintain, can be found within the Telecommunications Act 1997 (section 376), Radiocommunications Act 1992 (section 162)

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[66] DIN, Platform of the German Committee of Standards Users, available from https://www.din.de/en/services/german-committee-of-standards-users-in-din-anp

[67] RSWG Facilitator's report, available from https://puc.hawaii.gov/wp-content/uploads/2013/04/RSWG-Facilitators-Report.pdf

[68] ACMA, Technical standards, available from https://www.acma.gov.au/technical-standards and https://www.acma.gov.au/industry-codes-and-standards-telcos

and the Broadcasting Services Act 1992 (section 9A). ACMA is also responsible for making contributions to international telecommunications standards.

Under the Telecommunications Act, ACMA may require an industry body such as Standards Australia to develop a code / standard that is added to the register or it imposes its own standards. Thereafter, ACMA monitors the industry to ensure compliance to licence conditions, codes and standards, and to ensure regulations are responding to the needs of the community[69].

The Communications Alliance Ltd is a not for profit company formed to provide a unified voice for the Australian communications industry to make coherent and constructive contributions to policy development and debate, and to influence direction and priorities of the co-regulatory framework for the telecommunications industry. Membership of Communications Alliance is drawn from a wide cross-section of the communications industry, including service providers, vendors, consultants and suppliers. The Communications Alliance is an accredited Standards Development Organisation of Standards Australia for the development of standards within its specified scope of accreditation.

The telecommunications industry relies on self-declaration based on an appropriate level of testing, labelling regime, sample auditing, and prescribed penalties. Where non-compliance to the rules is observed, ACMA may investigate and/or issue infringement notices that can be appealing by writing to ACMA. The responsibility for compliance lies typically with the importer, manufacturer, or the licensed operator of a device.

Case study 4: Consumer Data Standards Australia

The Australian government has introduced a Consumer Data Right (CDR) giving consumers greater control over their data[70]. Part of this right requires the creation of common technical standards making it easier and safer for consumers to access data held about them by businesses, and – if they choose to – share this data via application programming interfaces (APIs) with trusted, accredited third parties.

The CDR is governed by the Treasury Laws Amendment (Consumer Data Right) Act 2019. This amends the Competition and Consumer Act and other statutes to provide individuals and businesses with a right to access specified data in relation to them held by business. The Consumer Data Right is intended to apply sector by sector across the whole economy, beginning in the banking sector. The next step for Consumer Data Right is in the energy and telecommunications sectors with other sectors to follow. The first stage (relating to banking) came into effect in February 2020.

CSIRO has been appointed by the Treasurer as the Data Standards Body (DSB) to support the delivery of the Consumer Data Right. The DSB is responsible for assisting Mr Andrew Stevens, the Data Standards Chair, in the development of common technical standards to allow Australians to access data held about them by businesses and direct its safe transfer to others. The scope of DSB activities includes information security.

The data "standards" in the Consumer Data Right are not a legislative instrument. The data standards adopted by the DSB are not a legislative instrument. They are intended to be

[69] ACMA, Industry codes and standards, available from https://www.acma.gov.au/about-industry-codes-and-standards

[70] ACCC, Consumer data right (CDR), available from https://www.accc.gov.au/focus-areas/consumer-data-right-cdr-0

largely in the nature of specifications as to how information technology solutions must be implemented in order to ensure reliable interoperability in relation to the sharing of data. They will only describe how the CDR must be implemented in accordance with the consumer data rules.

The work of standards development is conducted in close consultation with the Australian Competition and Consumer (ACCC), as lead regulator of the Consumer Data Right, supported by the Office of the Australian Information Commissioner (OAIC) Office of the Australian Information Commissioner (OAIC).

The CSIRO's Data61 has been appointed to provide operational support for the data standards body and, as such, has the accountability and responsibility to make the final recommendations to the Chair on the technical standards in line with the legislation and rules to be put in place for the regime[71]. The Chair has ultimate responsibility for decisions regarding the technical standards.

It seems likely that some DER-related data sets (notably the DER Register) may be captured by the CDR-Energy. The DSB model for developing standards could potentially be expanded to data and data security aspects of DER. This would ensure national consistency in technical standards for data and data security, alongside integration with the Consumer Data Right-Energy. For example, it is likely to apply to DER consumer data held by AEMO and the Clean Energy Regulator (including in relation to SRES).

Case study 5: ACCC rural water rights

Critical to the importance of standards development is the coordination of multiple state regulators in achieving regulatory compliance outcomes. The ACCC and state regulators play an important role in the monitoring, compliance and reporting of water charge rules and water market rules within Australia[72]. ACCC's role in the water sector is legislated under the Water Act 2007 and the Competition and Consumer Act 2010. Leading up to its clarity, south-east Australian governments and communities had encountered the complex issue of the sharing of the Murray-Darling Basin (MDB) water.

The Water Charge (Infrastructure) Rules (WCIR), which is one of four main statutory rules set under the Water Act, adopted a three-tiered approach to apply the form of regulation and requirements to different operators depending on the ownership and size of each operator.

Until recently the WCIR allowed an independent Basin State regulator to apply for and be granted with the accreditation to undertake approvals or determinations of regulated charges. The accreditation of state regulators was intended to lead to improved consistency in charging outcomes across Basin states.

However, ACCC's final rule advice and stakeholder feedback raised several issues in the inconsistency and subsequent inefficiencies in having multiple regulators across Basin States regulating water charges[73]. This has led to the ACCC repealing the relevant accreditation

[71] CSIRO, Consumer Data Standards - Data61, available from https://data61.csiro.au/en/Our-Research/Focus-Areas/Special-Projects/Consumer-Data-Standards

[72] ACCC, Role in water, available from https://www.accc.gov.au/regulated-infrastructure/water/accc-role-in-water

[73] ACCC, Water Charge Rules Final Advice, 2016, available from https://www.accc.gov.au/regulated-infrastructure/water/water-projects/review-of-the-water-charge-rules-advice-development/final-advice

provisions sections subject to transitional arrangements in its latest revision to take effect from July 2020[74]. The approval or determination of charges across Australia is now undertaken by the ACCC. Such an approach is being adopted in efforts to streamline the regulated water charges while still allowing for some discretion to both regulated entities and the regulator.

5.3 Summary

Other jurisdictions and sectors provide insights that can be used to inform the development of DER technical standards governance models in Australia. Learnings can be categorised into the following areas:

- Implementation of a dedicated, industry specific, standards body
- Models for standards decision making in a context of rapid technological change.

A dedicated standards body can be effective in achieving the level of consistency and regulation across the power sector that is needed for DER technical standards. In regions like Germany and North America, standardisation for electrical, electronic and information technologies technical standards is regulated through a single standards body. A standards body that collaborates across the various industry stakeholders and bodies can deliver industry wide consensus on DER technical standards.

In Germany the standards body, DKE, is a national non-profit based organisation; the standards it produces are able to be mandated through contracts, laws or regulations. Whereas the NERC is an independent authority capable of producing technical standards that are mandatory for adoption.

The telecommunications sector in Australia is also an example of the creation of an industry specific standards body. All technical standards for the wired and wireless communications and media infrastructure and services under the telecommunications sector in Australia is governed by the Australian Communications and Media Authority (ACMA) under Commonwealth legislation.

Under the Telecommunications Act, ACMA may require an industry body to develop a code or standard that is added to the register or it imposes its own standards. Communications Alliance is accredited Standards Development Organisation of Standards Australia. Thereafter, ACMA monitors the industry to ensure compliance to licence conditions, codes and standards, and to ensure regulations are responding to the needs of the community.

In 2010 the HPUC established a working group to respond to the rapid changes required in technical standards (related to DER and large-scale renewables) to achieve Hawaii's100% clean energy by 2045 target. The working group established strict decision-making processes in order to fast track decision making.

A key issue with each of these case studies is that the centralised institutions have been established of periods of time within single regulatory frameworks even where there is a federal system for example such as the United States of America, where there have been longstanding progressive movement towards harmonised national regulatory systems.

[74] ACCC, New water charge rules from July 2020, available from https://www.accc.gov.au/update/new-water-charge-rules-from-july-2020

6. Problem definition (case for action)

This section sets out a statement of the public policy problem ('problem definition' or case for action). Alongside the statement of policy objectives, the problem definition frames the identification of feasible options and the evaluation of these options, as set out in the following chapter.

6.1 The public policy problem

As for the statement of public policy objectives set out in section 2 above, Table 8 below applies the six metrics identified in the ESB Strategic Energy Plan[75] and used in the ESB's Health of the Electricity Market report[76], with adaptations for DER technical standards governance.

Table 8 Assessment against ESB Strategic Energy Plan

Strategic Energy Plan objective (performance metric)	Assessment based on evidence and consultation
Affordable energy and satisfied customers	Outcomes that contribute to increased energy costs and reduced customer satisfaction, whether consumers are participating directly in markets for DER services, or not.
Secure electricity system	Outcomes that do not fully support deployment of visible, flexible, DER installations able to provide essential system security services.
Reliable and low emissions electricity supply	Outcomes that do not support reliable and low emissions supply, including by avoiding the cost of higher marginal cost, higher emissions generation (compared with DER), to remain within the NEM reliability standard.
Effective development of open and competitive markets	Outcomes that do support the development of competitive markets for DER products and services, resulting in a lower rate of efficient uptake of DER installations than otherwise.
Efficient and timely investment in networks	Outcomes that do not avoid investment in networks – or reduce the costs of delay in network investments - where DER installations may be able to offer visible, secure and reliable substitutes for regulated network services, yielding lower network costs over time and contributing to the affordability, security and reliability objectives above.

[75] See Energy Security Board Strategic Energy Plan

[76] See Energy Security Board Health of the NEM, February 2020

Strong but agile governance	A DER technical governance system that is not capable of the timely delivery of adaptive regulation for the outcomes listed above. Performance targets are not set for all entities governing development and implementation of DER technical standards, and their adoption in multi-sided markets, there is no monitoring and compliance, any emerging integration or performance problems that could jeopardise achievement of policy objective are not detected and remedied.

In the absence of reform of the governance system, outcomes will not be consistent with the public policy objectives (and by implication the NEO). There is a much higher risk of a no-win outcome, under which there is substantial consumer investment in DER installations and appliances, alongside substantial utility investment in replacement of exiting generation, including storage and network capacity, resulting in widespread inefficient duplication of overall capacity and much higher overall electricity supply costs. This would reduce overall affordability and consumer satisfaction.

7. Identification of options

This section identifies and evaluates quick wins and options for addressing the public policy problem with structures that govern actions and decisions on DER technical standards, as set out in the previous chapter.

7.1 Short term actions or 'quick wins'

Consultation with stakeholders highlighted a number of priority issues, from which a subset of early actions has been identified that a champion may progress without delay, within the existing DER technical standards governance system. Note that while some of these actions have been discussed with agencies nominated to champion, no agreements have been reached or commitments made. The ESB will need to further engage with stakeholders to refine and implement these actions.

1. **Expedited ATS, led by the DEIP Standards, Data and Interoperability Working Group**: In the short term, AEMO would apply the existing Standards Australia streamlined process to produce an ATS within a production schedule of about 12 months. Proposed in the same manner as an Australian Standard, an ATS can be employed quickly to formalise the output of less formal development processes, most likely involving the DEIP Standards, Data and Interoperability Working Group.[77]
2. **AER/ENA/CEC negotiate to host a central information resource encompassing all current DNSP connection standards including regular updates**: This would most likely involve AER working closely with ENA to coordinate processes for regular sharing of DNSP information via the AER.[78]
3. **National DER stakeholder database:** The ESB DER Steering Committee would oversee the construction of a single coordinating individual and organisational contact database, organised by DER technology, standard, topic, existing standards groups. Access would be provided to recognised bodies/processes, with wider access by category invitation.[79] This would enable stakeholders to understand the scope of work being conducted on technical standards of DER technologies and maintain communications with the groups of stakeholders that have an interest in those technical standards. This may be compared, for example, with the contact databases for Food Standards managed by FSANZ that allow the national regulatory to maintain contacts with stakeholders in different standards in the Food Code.

There is a fourth 'quick win' option that requires further investigation:

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77 Standards Development – SG-003: Standards and other publications, available from https://www.standards.org.au/standardisation-guides

78 This may require little more than simplified URLs that are maintained by the AER to point to the latest DNSP document, that ENA and CEC can employ on a single webpage on their sites.

79 That is inviting all contacts identified by categories/DER technologies/standards to be invited to engage in a new initiative.

4. **AEMO coordinates fast track adoption of priority technical standards with CEC:** For example, inverter disturbance ride-through AS 4777 may be a candidate. AEMO would seek to negotiate with the DNSPs a base functionality and default/small set of technical settings and then publish these as an AEMO technical specification. The CEC has relationships with manufacturers to have this technical specification implemented in their products, particularly the small group of manufacturers that make 95% of the inverter market. The CEC can change its product approval process to include the AEMO published technical specification.[80]

7.2 Overview

The following options have been identified and assessed compared with a baseline option of no action. Table 9 below sets out a set of options from short term through to far reaching structural reform. While labelled options, these are escalating approaches with increasing degrees of centralised authority and responsibility.

Table 9: Escalating options for the future governance of DER technical standards

Option	Description
Option 1 No change	Short term actions identified only
Option 2 Targeted governing interventions	No change to DER standards governance system, short term actions are supported by targeted interventions, including a Statement of Policy Principles to facilitate early rule changes, and additional resources for ESB DER Steering Committee and Standards Australia DER technical standards development.
Option 3 Governance reform – improved governance system coordination	Create a new DER standards governance coordinating structure, with a statutory head of power, to provide clear leadership, and line of sight between a DER governance vision and continuing de-centralised governing of DER technical standards, supported by a new performance monitoring framework, along with improved monitoring, and compliance arrangements to allow earlier detection and remedies for non-compliance.
Option 4 Large scale Governance reform – Overhaul of governance of DER technical standards	As for Option 3, with the addition of far-reaching reform of DER technical standards governance, including by centralising DER technical governance decisions into a new national framework, seeking to achieve faster change and DER integration compared with the de-centralised Option 3.

These "options" may be considered as both a) options for the immediate decision to instigate governance reform and b) a longer-term plan to progress towards a final preferred state at some point in the future. That is, Options 2 may be progressed while implementing

[80] Note this option is currently available under the existing SRES framework. A second step could be to update the SRES regs to include the system security requirements

the planning for Option 3, and much of the preparatory and implementation work for Option 3 is preparatory work for Option 4 at a latter point.

These high-level options are described further below.

7.3 Option 1 – No change to governance structures with short-term 'quick wins'

The baseline option is where there is no structural change to the governance system for DER technical standards but short-term 'quick wins' are advanced. The existing parallel governance arrangements and cross-sectoral networks are retained, continue their current agenda for consideration of DER technical standards independently and pursue their own initiatives for self-improvement. Leadership will be required from the ESB to encourage champions to take up and conclude short term quick wins. Essential this is a very minor change to the status quo.

7.4 Option 2 – Targeted governing interventions

Option 2 seeks to achieve the similar outcomes to 'quick wins' – so there is no structural change and largely voluntary actions to champion quick wins and improve existing arrangements.

However, recognising the risk of delay from largely voluntary action, Option 2 seeks to provide additional impetus by enabling ESB leadership with a COAG mandate to target, prioritise, empower and resource early actions that promote improvements to existing processes and/or improve capabilities for coordination between existing governance processes and/or cross-sectoral networks.

Some of these early actions could be supported by the option that ESB can undertake Rule change processes in accordance with section 90F of the National Electricity Law (NEL).[81] These processes may be applied where rapid changes are required.

Possible candidates for targeted interventions include:[82]

1. An expedited rule change to create an obligation for DNSPs to contribute to a central information resource for all current DNSP connection standards, including regular updates. The ESB DER Steering Committee can review the requirement for DNSPs to publish connection requirements and, if necessary, the AEMC can undertake the appropriate Rule change process.
2. A legal review of AEMO current capability to mandate DER standards, commissioned by the ESB DER Steering Committee. An independent opinion regarding AEMO

[81] The ESB may recommend rules to the Energy Council if the following requirements are satisfied: the Rules are in connection with energy security and reliability of the NEM or long-term planning for the NEM; the Rules are consistent with the national electricity objective; and there has been consultation on the Rules in accordance with any requirements determined by the Council.

[82] Note that, if Option 3 is adopted, it is likely responsibility for the actions below could be allocated under the proposed new coordination structure.

capability to mandate DER standards for system security, interoperability and cyber security would provide a greater ability for AEMO to utilise such capability, if the ESB agrees that it is appropriate for AEMO to do so.

3. The ESB DER Steering Committee create a detailed map existing DER technical standards for each DER technology and sub-category, together with the corresponding responsible governance bodies and their decision-making processes[83]. This mapping would underpin the identification of relationships and gaps between standards and/or governance processes, and their alignment with to the ESB DER vision. In conjunction with the ARENA sector mapping for the State of the DER Market report, documenting these standards and activities in one location provides stakeholders with a clear line of sight between governance tasks they are engaged in and an agreed national objective/vision.

4. The ESB DER Steering Committee can engage with the NEM data strategy and the DSB to investigate the existing CDR energy data and cyber-security standards. This could include considering the potential for applying DSB determined standards to extend the DER Register from DER equipment characteristics to real-time DER visibility.

5. ESB DER Steering Committee can engage the ENA and DNSPs to produce a clear roadmap to harmonisation of DNSP connection agreements. Building upon the current national connection guidelines, the Roadmap would acknowledge both the cost to consumer of variations in requirement and DNSP differences and need to change in steps that work with local customers, while providing more transparency and certainty for consumers and installers.

   ESB DER Steering Committee could oversee the commissioning of a legal opinion clarify the existing and optional roles and responsibilities for compliance in a DER installation. This would seek to overcome the current fragmented regulatory environment that gives rise to legal ambiguities on the authority and responsibilities of the parties with legal responsibilities and obligations relating to DER installation and operation:

   a) Manufacturer – self certification or independent verification

   b) Product regulator – independent verification

   c) Owner/operator role – ultimate responsibility for installation operation, frequently met through contracted services

   d) Designer role – selection of compliant equipment and design and assembly instructions for compliant system (link with accreditation)

   e) Installer role – installation of equipment per compliant design, accurate recording of information

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83 As a rapid, high level review, the analysis of current arrangements in section 3 considers the major formal governance arrangements categorised by primarily by the source of authority. It does not, for instance, detail all the technical standards and corresponding governance processes applicable to rooftop solar PV systems (panels, wiring and inverters) nor reveal how these differ from, for example, solar hot water or small diesel generators.

f) DNSP role – industry agent at the regulatory boundary, legal responsibility for derogations from standards

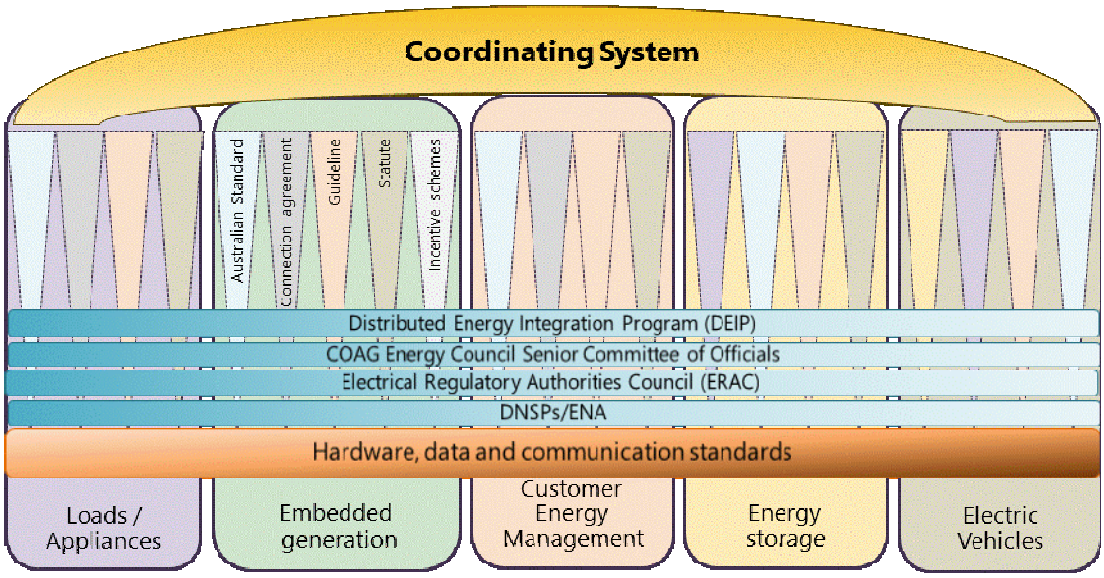
g) Energy safety regulator role– government agent at the regulatory boundary.

7.5 Option 3 – Governance reform – improved governance system coordination

7.5.1 Summary

Option 3 proposes some structural reform of existing governance arrangements in addition to pursuing quick wins and targeted interventions. Recognising both the regulatory complexity underpinning the current arrangements and the strengths of the existing processes, this reform option establishes a new DER standards governance coordinating structure. Figure 27 modifies the schematic depiction of the current governance arrangements for DER technical standards in Figure 17 overlaid with the proposed coordination system.

Figure 27 Proposed governance coordination system for DER technical standards



The term "structure" is used deliberately - there is no intent to create another energy sector governance institution, and currently there are regulatory barriers to creating a single institution with scope for both design and compliance with technical standards (see Figure 16 in section 2.3.2).

The purpose of the coordination system is to envelope the existing multiple technologies, multiple technical standards, and multiple structures/processes governing technical standards, with a clear (proposed) governance objective to *improve coordination and integration of DER technical standards governance where this promotes the NEL objective*.

This coordinating structure would have a statutory head of power establishing its governance objective, authority and responsibilities. Its core functions would be to provide clear sector

leadership for adaptive regulation to achieve its governance objective and coordination to the continuing decentralised governance processes for DER technical standards. Significantly it would be able to identify priorities and gaps and ensure they are allocated to existing standing committee or newly created taskforces tasked with a particular time limited objective.

Possible functions are discussed further below, noting that the current description is high level because a detailed design phase including consultation to determine purpose agreement and function agreement would follow a decision in principle.

Building on the initiatives for individual governance processes, with a COAG mandate to provide sector leadership and resourcing the coordinating system would be a kind of "Board of Boards" providing a range of coordinating functions.

The sections below describe the possible functions of system coordination and possible institutional arrangement for the system. These are framed as possible functions and arrangements at this time because it is envisioned that the detailed design stage following a decision in-principle (see Roadmap/next stapes in section 7.8 below) would include consultation to negotiate stakeholder agreement with the proposed governance objective, functions and arrangements.

Initial views on this option were discussed with stakeholders. In introducing the option, it was made clear that the language of a system or a structure was deliberate, and this is not a proposal for another energy sector governance institution. Overall stakeholders support an arrangement to achieve these objectives.

7.5.2 Possible functions

The core function of the governance system coordination to achieve the (proposed) governance objective is to provide leadership to the DER sector for the major cultural shift that is required with sufficient resources to enable existing decision-making communities to achieve target outcomes. This would include, for example:

- Providing a clear vision of DER integration, including governance of technical standards
- Providing a DER technical standards evolution roadmap or similar process for adaptive regulation
- Being able to proclaim existing working groups or processes as meeting roles in that roadmap.

The substantial functions underpinning this leadership will be maintaining a set of coordination tasks supporting DER community building, such as:

- Identification of existing DER technical standard workstreams (vertical) and workgroups (horizontal) and mapping alignment to vision
- Identification of gaps, and allocation to existing or new workstreams /workgroups as necessary, including expectations on schedule and stakeholder participation
- Coordinating with Consumer Data Standards Australia on data and data security standards and the extent these could efficiently be adopted for DER platforms

- Facilitating information exchange and education (preferably as wrapper for existing and/or planned mechanisms)
- Monitoring the DER sector's achievement against the Roadmap, including:
  - Developing performance targets for standards development and integration for all DER technical standards, including the adoption of the standards by relevant markets (DER manufacturers, installers, operators and other users) necessary to achieve public policy objectives
  - Monitoring progress on DER standards development etc. relative to the performance targets
  - An authority to 'call in' governance of technical standards from the responsible parties if performance targets are at risk of being missed (to cut through any hold ups)
  - Facilitating governance evaluation of individual governance structures/processes.

7.5.3 Possible arrangements

Stakeholders are strongly supportive of the development of a coordinating structure that is not another energy sector governance institution. The primary concerns expressed by stakeholders are about the institutional arrangements for Option 3 – as noted above this strawperson has been discussed so far at a high level anticipating a detailed design phase including consultation as the first phase of development following a decision in principle (see the Roadmap below).

Stakeholders expressed clear conditions to gain their support include:

- The imprimatur of COAG Energy Council – a mandate to achieve objectives and undertake functions
- Transparency in membership and decision making, including best practice governance processes providing clear decision making
- A balanced representation of DER stakeholders with visible independence from stakeholders that have a perspective/interest in DER (including market bodies)
- Adequate resourcing to commit to the functions required to deliver against the governance objective.

7.6 Option 4 – Large-scale governance reform – Overhaul of governance system

7.6.1 Summary

The functions and activities of Option 4 are broadly similar to Option 3, but with the addition of far-reaching reform of DER technical standards governance.

The key difference is a much greater degree of centralisation of authority, responsibility and resources. This would include creating a new DER technical standards governance entity (or appointing an existing entity to this role). It would also involve centralising DER technical governance decisions within a new national framework, including the required regulatory harmonisation, together with accreditation as an Approved Standards Development Organisation. With centralisation, along with the establishment of an entirely new entity, then, once established, Option 4 may be expected to achieve faster change and DER integration compared with the de-centralised Option 3.

This option seeks to respond to the views of some stakeholders in support of a far reaching "shakeup" in the governance of technical standards in the DER sector. Further work would be required to specify this option. This could be undertaken during the first (design) phase of the proposed roadmap set out below. However, our assessment is that it is unlikely this option could be implemented within 12 months of a COAG Energy Council decision in principle. This is because the option would involve a very large scale and complex transfer of governance responsibilities from existing governing entities to the proposed new central DER technical standards governance entity.

Drawing on the examples described in section 5, the two dominant models for regulation of technical standards are:

- A wholly government regulator, with a legislative basis for forming and enforcing technical standards
- A co-regulatory institution combining government and industry stakeholders, accredited as a Standards Development Organisation of Standards Australia for the development of standards with regard to DER technical standards.

Both would require further harmonisation of the inter-jurisdictional regulatory framework, although it is likely less change would be required to empower a co-regulatory institution between industry and the different jurisdictions than to form a single government entity with the required end-to-end authority.

7.7 Options assessment

The options assessment is based on the problem definition set out in Section 5 above. It draws on the evidence from the desktop review, the structured interviews and the survey.

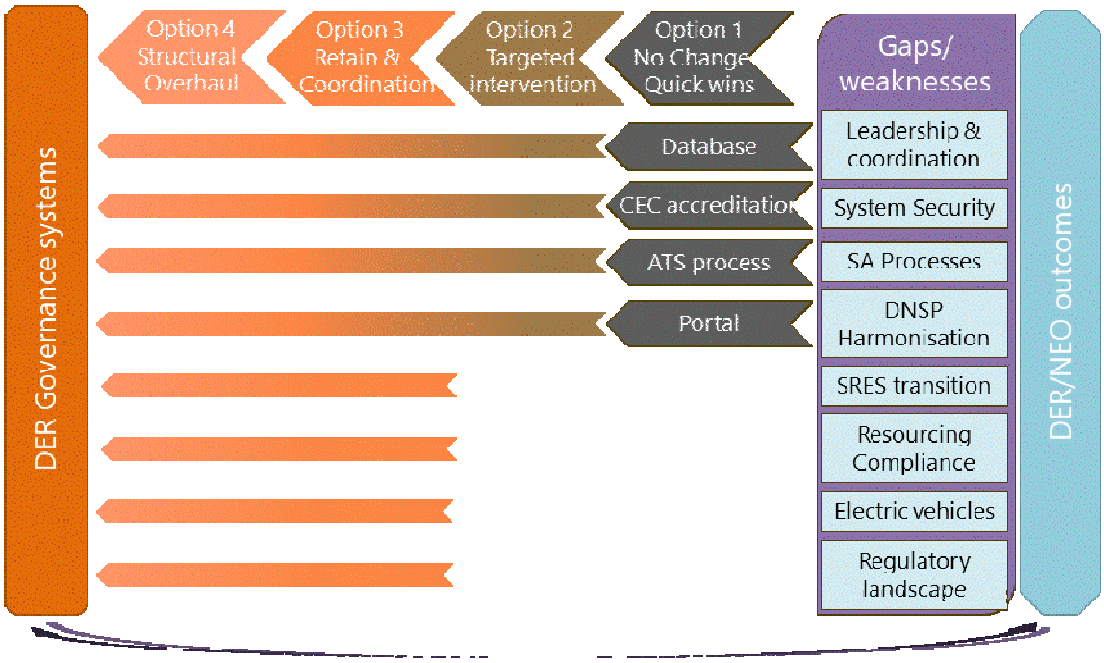
The diagram below in Figure 28 closes the loop in Figure 15 between the DER governance system and DER/NEO outcomes, indicating the scope of each option to address identified gaps and weaknesses in the governance of DER Technical Specifications that are obstacles to achieving desired DER/NEO outcomes. A detailed tabular analysis of how gaps and weaknesses are addressed under each option is included in Appendix 2.

Option 1 make incremental improvements to the status quo, but does not address the lack of leadership, coordination and the challenges of institutional and cultural roadblocks. As noted in the summary of findings, Option 1 is not considered capable of delivering outcomes that are consistent with the proposed public policy objectives, or with most stakeholder views. There are some 'quick wins' for some of the identified governance weaknesses, but not others. In particular, there are no quick wins with respect to:

- Verification and enforcement of installation compliance, as this requires coordination across regulatory and jurisdictional divisions

- Building and transport electrification (e.g. heat pumps and electric vehicles), as this requires coordination with building and transport standards.

Figure 28 Assessment of options against gaps in achieving DER/NEO outcomes



Option 2 is also not considered capable of delivering outcomes consistent with the proposed public policy objectives, or with most stakeholder views. There may be some targeted actions that address some of the shortcomings of targeted arrangements, so Option 2 is superior to Option 1. However, like Option 1, Option 2 cannot adequately address the coordination issues required within the divided regulatory environment of the electricity sector and between the electricity and building and transport sectors.

Option 3 tackles key weaknesses in the current DER technical standards governance system - leadership and coordination within and between electricity and other sectors. Whilst retaining and building upon the existing strengths in the existing distributed DER technical standards governance system, it adds an overarching leadership and coordination structure that can begin to address the challenges of cultural and regulatory change while prioritising and advancing identified gaps and priorities.

Within an overall Roadmap for adaptive regulation in DER technical standards, Option 3 can pursue the quick wins and targeted interventions that deliver short term improvements while the structure itself is designed and implemented and then provides both the coordination to advance priority technical standards whilst also developing the roadmap to address road blocks in the current regulatory frameworks.

There is nevertheless a significant risk that Option 3 does not go far enough to ensure realisation of potential DER benefits and the achievement of the NEO. This is because it does not directly change the piecemeal or siloed governance under the current DER technical standards governance system.

Option 4 is a major reform option where governance of DER technical standards is centralised under a single national system allowing more substantial change. This directly addresses the current piecemeal or siloed culture by bringing all responsibilities under the

aegis of a single authority. This is a relatively common arrangement in comparable industries and jurisdictions.

However, the design and implementation of Option 4 requires regulatory reforms of a sector that is heterogeneous and has not made significant steps towards harmonisation to date. These reforms introduce significant risks and possible delay from the change process. There is a risk that effort is diverted to the design of the governance system to address those challenges during a period of the near future in which attention should be applied to adaptive governing of priority DER technical standards required in the immediate future.

As already noted, these options escalate in a way that the tasks required for the establishment of Option 3 and near-term priorities are similar tasks required to prepare for the development of Option 4. This includes a requirement to advance interjurisdictional regulatory harmonisation for the development of a cost effective national DER installation compliance framework. Hence an immediate decision to proceed with Option 3 does not preclude a later decision to continue tackling the significant change in the sector by progressing to Option 4.

In the context of the timeframe for this review, a definitive choice between Options 3 and 4 is not possible or desirable at this time – this review is not a RIS and has not conducted an analysis of the costs and benefits of Options 3 and 4. A qualitative assessment of costs would infer that the direct costs of regulatory change to achieve the required regulatory harmonisation for Option 4 and the indirect costs of delay (r3educed benefits) from that change process would be significant and additional to the costs for Option 3.

Furthermore, in the context of the timeframe for this review, the immediate choice is whether or not to instigate a reform process for the system of governance of DER technical standards. On balance, a change to this governance system is desirable to achieve immediate institutional change and better DER system outcomes in the immediate term (say 1-3 years) and in the medium to longer term (say 3 to 10 years).

On balance, the preferred option available for governance reform is Option 3. As described below in the Roadmap section below, there is a design stage to develop stakeholder agreement with the proposed reform design and the outcome could be a variation on Option 3 as described here, or an evolution toward Option 4.

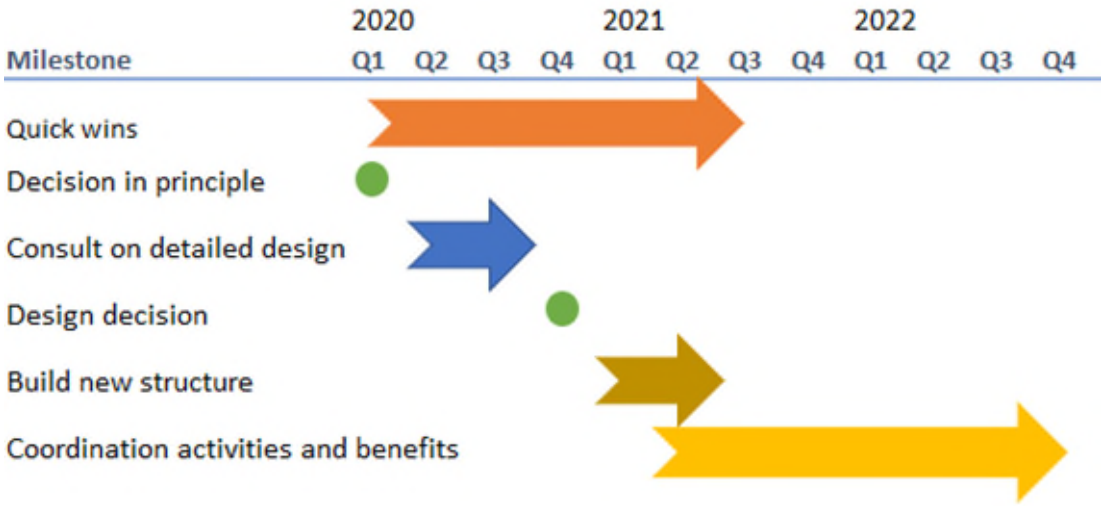
In the event there is a future decision not to proceed further with governance reform, then there would be a loss from the sunk cost from the development of the detailed design and associated consultation. Some of this sunk cost could be offset by benefits from 'quick wins'.[84] If a decision is not made in March to initiate the development of a detailed design for Option 3, then the opportunity cost could be high. This is because a further seven (7) months would have been lost toward addressing the problems identified in this report.

[84] The sunk costs of revising a March decision to implement a reform process are largely the salaries of government staff developing the project and stakeholders' time engaging with consultation, based on a benchmark value $200k pa per person. To the extent the quick wins improve AEMO's confidence in the DER fleet being installed now, future market costs for system security are reduced.

7.8 Roadmap/next steps

This section sets out a roadmap for the implementation of Option 3. Figure 29 describes a timeline where the 'quick wins' under Option 1 and targeted interventions under Option 2 are pursued immediately. The roadmap envisages a timeline where the new governance system under Option 3 is up and running from the middle of 2021. After that, the new governance structure is able to determine performance targets for DER governing and to begin its monitoring activities, and where necessary, interventions.

Figure 29 Timelines for development of coordinating structure



Under the proposed roadmap, the first decision is required at the March 2020 COAG Energy Council meeting, whether to endorse in-principle the detailed exploration and design of the options proposed in this report. This allows around six months for the detailed design and another 6 months to establish the new governance structure. From the second quarter of 2021, the new structure is undertaking coordination activities and delivering benefits. It also assumes responsibility for any ongoing tasks from 'quick wins'.

Key issues to be resolved in the design stage include the following:

- The functions and objectives of the governance structure and the vision for its evolution (e.g. is Option 3 an end state or a milestone toward some form of Option 4)
- Legal architecture (e.g. State or Commonwealth based, or combination)
- Participation and allocation of decision rights between participants (in statute, recognising that consumers collectively are the major funders of DER markets and have a vital interest in maximising the benefits from better DER technical standards integration, while at the same time ensuring decision rights are also allocated to DNSPs, AEMO and DER market participants
- Process for decision making (set out in Statute) (e.g. who can decide what and what do they have to do first?)

- Resourcing implications and funding options for operating DER governance structure (budget bid and funding options) for operating the new governance structure, including the size and location of any secretariat role
- The extent DER technical data and data security standards processes should be integrated with Data Standards Australia.

A final decision on the design would be made at the scheduled COAG Energy Council meeting in October 2020. Following this, a period of up to nine months has been allowed to establish the new structure. This may include new legislation and associated resourcing.

There is scope to revisit or overturn the decision in principle before a final commitment is made to invest in the new Governance structure itself. The only sunk cost would be the resources uses to develop the detailed design. This sunk cost may be in the millions of dollars, while the costs of delay would be a multiple of this.[85] This suggests that approval of a decision in principle is consistent with the least regrets' principle.

[85] The sunk costs of revising a March decision to implement a reform process are largely the salaries of government staff developing the project and stakeholders' time engaging with consultation, based on a benchmark value $200k pa per person. The costs of delay arise from many sources is two main classes, being deferred investment in lost cost generation and/or load reduction or demand response equipment, and the higher future system security costs from continuing reduced levels of technical compliance and the resultant uncertainty and conservative system management and possible (avoidable) event losses.

Appendix 1 Stakeholder engagement

Consultation Class	Organisation	Survey completion rate	Consultation	Webinar
Consumer	Energy Consumers Association	100%	✓	✓
	Public Interest Advocacy Centre		✓	✓
	Total Environment Centre		✓	
Market Bodies	AEMC	100%	✓	✓
	AEMO		✓	✓
	AER		✓	✓
Officials	ACT	67%		
	Commonwealth			✓
	NSW		✓	✓
	Queensland		✓	✓
	South Australian		✓	✓

	Victorian		✓	✓
Regulator	Clean Energy Regulator	100%	✓	✓
Jurisdictional safety regulators	Office of the Technical Regulator, South Australia	100%	✓	✓
Standards organisations	Standards Australia	100%	✓	✓
Industry group	Australian Alliance for Energy Productivity	78%		
	Australian Energy Council		✓	✓
	Australian Industry Group			
	ARENA			✓
	CEC		✓	✓
	Competitive Metering Industry Group		✓	✓
	E3 committee		✓	
	Electric Vehicle Council		✓	✓
	IoT Alliance			✓
	Smart Energy Council			✓

Network	AusNet Services	92%		✓
	CitiPower, Powercor, United Energy			
	Endeavour Energy			✓
	Energy Networks Australia		✓	✓
	Energy Queensland		✓	✓
	Essential Energy			
	Evoenergy			
	Jemena			✓
	Horizon Power		✓	✓
	Power Water Corporation			
	SA Power Networks		✓	✓
	TasNetworks		✓	✓
	United Energy			✓
	Western Power		✓	✓

New tech	DXC	100%		✓
	Enel X			✓
	GreenSync			✓
	Power Ledger		✓	✓
	Rheem Australia Pty Ltd		✓	✓
	Solar Analytics		✓	✓
	Tesla		✓	✓
Retailer	AGL	40%		✓
	Energy Locals			✓
	EnergyAustralia			
	Powershop			
	Simply Energy			
Research	Australian National University	67%	✓	✓
	CSIRO			✓

	Melbourne Uni Energy Institute			
	The University of Sydney			✓
	The University of Queensland			✓
	UNSW		✓	✓

Appendix 2 Options assessment against gaps/issues

Potential response to critical gaps/issues	Pros	Cons	Quick Win	Option 2 - Can be done within existing structures	Option 3 - Would be improved with new structure to coordinate	Option 4 - Requires new structure to overhaul
1) Lack of leadership and coordination						
No implementation of changes - Decisions are continued to be made within existing structures	Decisions can be made quickly without requiring establishment of a new structure	Results in uncoordinated decision making	✗	✗	✗	✗
Establish a new structure to coordinate decision making	Results in more coordinated decision making	Requires delay while a new structure is being established	✗	✗	✓	✗
Establish a new structure to overhaul DER technical standards	Allows for making deeper changes where required	Involves greater authority and there is a potential for long delay while a new structure is being developed	✗	✗	✗	✓
2) Lack of fitness for purpose of Standards Australia process						
No implementation of changes - Standards are made under existing Standards Australia processes	Utilises the existing established process, with some strengths	Timeframes involved are not fit for purpose, limitations exist in extent of stakeholder participation, and decision-making processes are not aligned to the NEM	✗	✗	✗	✗
Make better use of existing Standards Australia processes including utilisation of faster Technical	Improves timeframes	Does not improve decision making processes	✓	✗	✗	✗

Potential response to critical gaps/issues	Pros	Cons	Quick Win	Option 2 - Can be done within existing structures	Option 3 - Would be improved with new structure to coordinate	Option 4 - Requires new structure to overhaul
Specification Process and provision of external funding where required						
Reform of existing Standards Australia process (including external funding) process to enable faster decision making and explicit decision making objectives consistent with NEO	Improves timeframes and aligns to NEO (subject to agreement by Standards Australia)	Does not change the ability for stakeholders without sufficient resources to contribute	✗	✓	✓	✗
Create a new standards body	Potential to establish a bespoke, fit for purpose process that reflects an approach adopted by other industries and international jurisdictions with similar issues	Requires potentially long delay while a new structure is being established	✗	✗	✗	✓
3) Technical standards related to system security						
No change – System security requirements are set via Standards Australia processes (e.g. AS 4777) which already have legal standing	No legal or regulatory change required	Subject to Standards Australia process (see 2 above)	✗	✗	✗	✗
AEMO prepares industry guidelines which sets DER technical requirements for system security which are then implemented under SRES via CEC accreditation scheme	No legal or regulatory change required Could be done in the interim while other rule change processes were being explored	Would only be effective while SRES is relevant Subject to CEC process and member consultation which could be lengthy (no prescribed limit)	✗	✓	✓	✗

Potential response to critical gaps/issues	Pros	Cons	Quick Win	Option 2 - Can be done within existing structures	Option 3 - Would be improved with new structure to coordinate	Option 4 - Requires new structure to overhaul
		and limits other external stakeholder participation				
Implement a rule change to require AEMO to prepare industry guidelines which set DER technical requirements for system security which are then required to be implemented via network connection arrangements	Allows AEMO to set system security requirements commensurate with level of risk, stakeholders have opportunity to contribute to rule change and the guideline approach allows for flexibility over time	Rule change is likely to be slow, and may potentially lead to unexpected outcomes (if an alternative approach is identified via the rule change process)	✗	✓	✓	✗
ESB fast tracks a rule change to require AEMO to prepare industry guidelines which set DER technical requirements for system security which are then required to be implemented via network connection arrangements	Fast (compared to full rule change process), and the guideline approach allows for flexibility over time	Some stakeholders may be critical of the lack of consultation under a fast tracked process in rules	✗	✓	✓	✗
AEMO (voluntarily) prepares industry guidelines which sets DER technical requirements for system security which are then required to be implemented via network connection arrangements (subject to legal review to determine whether AEMO is ready)	Fast (does not require a rule change)	May not be possible (depends on outcome of legal review), and involves a lack of formal stakeholder consultation process (other than that adopted by AEMO)	✗	✓	✓	✗

Potential response to critical gaps/issues	Pros	Cons	Quick Win	Option 2 - Can be done within existing structures	Option 3 - Would be improved with new structure to coordinate	Option 4 - Requires new structure to overhaul
DER technical requirements for system security are **set out within NER** and are then required to be implemented via network connection arrangements	Adopts rigorous stakeholder participation for rule change process	Slow to develop and is inflexible	✗	✓	✓	✗
4) Lack of harmonisation in network connection standards						
No implementation of changes - DNSP connection standards diverge relying on voluntary efforts between some DNSPs to harmonise	Utilises largely existing processes, and is industry-led (low cost)	Lack of harmonisation across all DNSPs, with limited opportunity for stakeholder participation	✗	✗	✗	✗
ENA reinvigorates industry guidelines approach	Utilises largely existing processes	ENA may not be willing to champion (and an alternative champion may need to be found), there is a limited opportunity for stakeholder participation, and a potential for adopting "lowest common denominator approach"	✗	✓	✓	✗
DNSP requirements are set out directly in NER	Leads to high degree of harmonisation, and the rule change process may avoid "lowest common denominator" approach	Rule change is likely to be very slow, and the requirements are inflexible (requiring a rule change to amend)	✗	✓	✓	✗
DNSP requirements are set out in Australian Standards which are then	Leads to high degree of harmonisation	Subject to Standards Australia process (see 2 above)	✗	✓	✓	✗

Potential response to critical gaps/issues	Pros	Cons	Quick Win	Option 2 - Can be done within existing structures	Option 3 - Would be improved with new structure to coordinate	Option 4 - Requires new structure to overhaul
mandated either via state based electrical safety legislation or NER						
DNSP requirements are set out by a new standards body	Leads to high degree of harmonisation, and a bespoke, fit for purpose process	Requires potentially long delay while a new structure is established	×	×	×	✓
5) SRES transition						
No implementation of changes - CEC responsibilities for compliance dissolve	None	No clear mechanism for testing and accreditation of products and installers	×	×	×	×
CEC's role for managing product and installer accreditation is expanded to all DER (including DER outside of SRES)	Utilises existing (largely successful) mechanism	Requires legislative and regulatory change to establish new role	×	×	×	✓
CEC's role for managing product and installer accreditation is transferred to networks	Does not require legislative or regulatory change	Lack of national coordination and requires additional resources for DNSPs	×	✓	✓	×
CEC role for managing product and installer accreditation is transferred to state-based electrical safety and technical regulators	Utilises existing processes	Lack of national coordination, requires additional resources for safety and technical regulators, and may require legislative change (depending on state)	×	✓	✓	×
6) Under resourcing of compliance and enforcement activities						

Potential response to critical gaps/issues	Pros	Cons	Quick Win	Option 2 - Can be done within existing structures	Option 3 - Would be improved with new structure to coordinate	Option 4 - Requires new structure to overhaul
No implementation of changes - Compliance and enforcement is undertaken in an uncoordinated and ineffective manner	None	Risk of non-compliances	✗	✗	✗	✗
Compliance and enforcement activities transition to state based electrical safety and technical regulators with increased funding	Utilises existing processes	Lack of harmonisation across states, and may require legislative or regulatory change for regulators without head of power to address non-safety risks	✗	✓	✓	✗
Compliance and enforcement activities transition to networks with additional allowances for activities determined by AER using whole of industry analysis of benefits	Utilises existing processes (but expanded), with no legal or regulatory change	Lack of harmonisation across DNSPs, and significant costs which would be borne by consumers (but should be offset by benefits)	✗	✓	✓	✗
Compliance and enforcement activities undertaken by a new body	Harmonisation and coordination across jurisdictions	Requires potentially long delay while a new structure is established	✗	✗	✗	✓
7) Lack of coverage of existing governance models to electric vehicle technology						
No implementation of changes - EV technology not explicitly considered in coordinated way	None	Uncoordinated and ineffective consideration of risks of EV technology to network and system	✗	✗	✗	✗

Potential response to critical gaps/issues	Pros	Cons	Quick Win	Option 2 - Can be done within existing structures	Option 3 - Would be improved with new structure to coordinate	Option 4 - Requires new structure to overhaul
EV technical standards set by state based electrical safety technical regulators	Utilises existing processes	Lack of harmonisation across states, and may require legislative or regulatory change for regulators without head of power to address non-safety risks	✗	✓	✓	✗
EV technical standards set by NSPs via connection arrangements	Already occurring to some extent, utilises existing processes	All issues related to DNSP connection standards (see 4 above) remain relevant	✗	✓	✓	✗
Compliance and enforcement activities undertaken by a new body	Harmonisation and coordination across jurisdictions	Requires potentially long delay while new structure is established	✗	✗	✗	✓