Australian Energy Market Commission

RULE CHANGE

CONSULTATION PAPER

National Electricity Amendment (Register of distributed energy resources) Rule 2018

Rule Proponent(s)
COAG Energy Council

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About the AEMC

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

Contents

1 Introduction

On 5 October 2017, the Council of Australian Governments Energy Council (COAG Energy Council or proponent) submitted a rule change request to the Australian Energy Market Commission (AEMC or Commission) seeking to improve the collection and sharing of information about small-scale behind the meter distributed energy resources (DER) in the National Electricity Market (NEM).

According to the proponent, the primary objectives of the register are to improve power system and network security and operation, through the provision of better information on behind the meter DER.

This consultation paper has been prepared to facilitate public consultation on the rule change request and to seek stakeholder submissions.

This paper:

- sets out a summary of, and a background to, the rule change request;
- sets out the proposed assessment framework to be used by the Commission in assessing the rule change request;
- identifies a number of questions and issues to facilitate the consultation on this rule change request; and
- outlines the process for making submissions.

Submissions on this consultation paper are due by no later than **17 April 2018**. Details on how to lodge a submission are contained in Chapter 6 of this consultation paper. A template is available to help stakeholders provide their views on the issues raised in the paper.

2 Background

This chapter provides background to the rule change request, including an explanation of relevant work undertaken by the COAG Energy Council.

2.1 History of the rule change

At its December 2015 meeting, the COAG Energy Council endorsed its Energy Market Transformation Project Team (EMTPT) to progress a work program aimed at ensuring that the energy market is receptive to new technologies.[1] Part of this work program was to launch a consultation process on the merits of a national battery storage register.

2.1.1 COAG Energy Storage Registration Consultation Paper

In August 2016, the EMTPT launched a consultation process on the merits of establishing a national register of small-scale battery storage systems.[2]

A consultation paper on which submissions were sought considered that the take-up of DER would increase and that a register of DER may:

- improve power system and network security – this is because expected take-up of DER by consumers will reduce the amount of generation over which the Australian Energy Market Operator (AEMO) has visibility and control to operationally manage the power system
- be useful for emergency response purposes, given the potential for fire or explosion with DER technology – when emergency response teams are called to respond to an incident, the EMTPT noted that a register could potentially inform them of the location and chemistry type of both grid-connected and off-grid storage devices
- promote industry integrity by helping consumers, line workers and installers obtain critical information before conducting activities related to battery storage.

Of the 25 submissions received through the consultation process, more than half agreed that the register should be established. There was broad agreement that the data should be collected by distribution network service providers (DNSPs) or energy storage installers, and that the register should be administered by a national government agency.[3]

1 COAG Energy Council, *Meeting Communique*, 4 December 2015, Canberra.

2 Energy Market Transformation Project Team, *Energy Storage Registration*, Consultation Paper, 19 August 2016.

3 Submissions to the consultation paper: Ausgrid p. 1; ANU Energy Change Institute, pp. 3-4; Clean Energy Council, pp. 7-8; Endeavour Energy, p. 1; Energy Consumers Australia, p. 7; Energy Networks Australia, p. 3; Ethnic Communities' Council of NSW, p. 3; K&W Mallesons, p. 9.

There were some concerns expressed about whether the costs of developing and maintaining a register would outweigh the benefits. Electricity retailers, in particular, were concerned that a register might add unneeded regulatory burden to an emerging industry.[4] There were also several concerns expressed about consumer privacy, with several stakeholders advocating that consumers should at minimum have a right to access and correct their own information.[5]

Views expressed in submissions are further discussed in Chapter 5.

2.1.2 Cost-Benefit Analysis

At its 14 December 2016 meeting, the COAG Energy Council agreed in principle to develop a national battery storage register subject to the outcome of a cost-benefit analysis (CBA).[6] The EMTPT subsequently commissioned Jacobs in March 2017 to develop this analysis, with the COAG Energy Council endorsing the final CBA report for public release in July 2017.[7]

Jacobs' CBA compared a register hosted by AEMO or, alternatively, the Clean Energy Regulator (CER) with a base case scenario of no register.[8] Key assumptions and design features of the register are listed in Table 2.1 below. A third scenario whereby DNSPs hosted their own databases was not explicitly quantified as it was deemed to be prohibitive in cost.

Table 2.1 Cost-benefit analysis options

	Option 1	Option 2
Database host	AEMO	CER
Collection mechanism	Expand existing DNSP connection agreements through a new app designed for the register.[9]	Expand existing CER collection mechanisms.
Data collector	Installers	

4 Submissions to the consultation paper: AGL, p. 1; Climateworks, p. 1; Origin energy, p. 3.

5 Submissions to the consultation paper: AESA, p. 2; Electrical Trades Union of Australia, p. 2; Dr Penelope Crossley, p. 15; Public Interest Advocacy Centre, p. 2.

6 Energy Market Transformation Project Team, *Energy Market Transformation Bulletin No 04 - National Battery Storage Register Consultation*, 22 May 2017.

7 COAG Energy Council, *Register of distributed energy resources*, rule change request (rule change request), October 2017, p. 6.

8 The base case was that: (1) There would be no further investment in a national register; (2) AEMO would continue pursuing and eventually installing a separate real time database; and (3) Distributors would continue to enhance and develop their own databases, but because of data collection issues would only collect around 30% of new storage installations.

9 It is assumed that data is collected using a new fit for purpose app that can be used to streamline existing DNSP processes.

	Option 1	Option 2
Technologies	Batteries (assumed life: 10 years), solar photovoltaic (PV) systems (assumed life: 20 years), inverters, with the flexibility to include other DER.	
Key assumptions	• 100 per cent of new DER installations, including retrofits would be captured by the register. The register would not capture installations that were in place before the register commenced, unless they are altered.[10] • The register would include static data only[11] • The study evaluated costs and benefits to 2030, using a discount rate of seven per cent • It is estimated that solar PV systems data would be less reliable from 2024 when incentives to register with CER are much lower than at present • The app in option 1 would reduce the time taken to complete connection notices by 45 per cent • 80 per cent of new batteries would be installed with a PV system.	

To estimate costs, Jacobs considered the information required by different user groups as well as associated access arrangements. It was assumed that the data in Table 2.3 would be collected and provided to different users through four different interfaces (portals), to reflect the various information requirements of users as well as any privacy laws.[12] Jacobs also noted that some stakeholders had expressed the view that the list of data was too extensive and should be reduced to avoid a burden on installers.[13]

Table 2.2 Data collected and access arrangements[14]

Portal	Portal user(s)	Data collected
1	AEMO	• National Metering Identifier (NMI) • Installation date

10 It was assumed that under the base case: 100 per cent of new PV systems would be captured in the CER's small-scale technology certificate (STC) database and on individual DNSP databases until 2024, and only 30 per cent of new battery installations would be captured.

11 The CBA assumed that AEMO would proceed with collecting real-time data regardless of whether the battery register went ahead.

12 Jacobs, Cost Benefit Analysis of options to collect and share information about small scale battery storage, final CBA report, June 2017, pp. 26-27.

13 Jacobs, Cost Benefit Analysis of options to collect and share information about small scale battery storage, final CBA report, June 2017, p. 27.

14 Jacobs determined the data in this table after consultation with AEMO and DNSPs.

Portal	Portal user(s)	Data collected
		• Decommissioning date • Manufacturer make and model number • Capacity • Performance derating • Device part of aggregated control • Trip settings (inverters) • Enabled mode of operations (inverters)
2	DNSPs	• NMI or postcode • Installation date • Decommissioning date • Manufacturer, make and model number • Capacity (continuous kW and storage kWh) • Performance derating • Device part of aggregated control • Trip settings (frequency and voltage) • Enabled mode of operations (inverters) • Demand side participation contract • Customer details - customer name, phone numbers, email address
3	Emergency response agencies	• NMI • Address • Contact details • Existence of battery • Battery type and make • Chemical composition • Capacity
4	Policy makers, researchers, consultants and market investors	Aggregated data only (by postcode, statistical area or zone substation): • Technology • Capacity

In reaching its conclusion, Jacobs quantified benefits to power system and network planning from more accurate long-term forecasting, and surmised qualitative benefits to market operation and safety.

The results of the CBA showed a positive benefit-cost ratio for a register hosted by either AEMO or the CER. In particular, Jacobs' found the net present value (NPV) of Option 1 (AEMO) to be $15.1m, and of Option 2 (CER) to be $13.3m. The difference in value between the two options was predominantly due to the collection costs being lower for Option 1, as data was assumed to be collected using a new app. If the same data collection improvements were applied to both models, Jacob's concluded that Option 2 would have the higher NPV.

2.1.3 Finkel Recommendation[15]

The *Independent Review into the Future Security of the National Electricity Market*[16] final report was released on 9 June 2017 and outlined 50 key recommendations to reform the energy market. One of these recommendations, Recommendation 2.6, called for the COAG Energy Council to implement a record of static and real-time DER:

> "The COAG Energy Council, in addition to its project on energy storage systems, should develop a data collection framework (or other mechanism) to provide static and real-time data for all forms of distributed energy resources at a suitable level of aggregation. The project should be completed by mid-2018."

In line with this recommendation, on 14 July 2017 COAG agreed to initiate the development of a national register for DER (including solar generation and batteries), acknowledging the first step would be the drafting of a rule change proposal.[17]

2.2 Related projects

There are a number of rule changes and reviews undertaken by the Commission that are either ongoing or have been completed in recent years which are related to this rule change request. A summary of each of the projects is set out in Appendix A. Where a project is directly relevant to an issue raised by the rule change request, this is discussed later in this consultation paper.

15 Dr Alan Finkel, *Independent Review into the Future Security of the National Electricity Market*, final report, June 2017, p. 22.

16 This review was chaired by Australia's Chief Scientist Dr Alan Finkel AO.

17 COAG Energy Council, *Meeting Communique*, 14 July 2017, Canberra.

3 Details of the rule change request

This chapter provides an overview of the issues and proposed solution in the rule change request.

The COAG Energy Council's rule change request proposes to set up a national register of DER by placing an obligation on AEMO to establish the register and collect information from DNSPs, in addition to imposing an obligation on DNSPs to collect this information and share it with AEMO.[18]

Whilst initially suggesting the register would be applicable to small-scale batteries installed at households and small businesses, the COAG Energy Council noted that the register would need to evolve to include other technologies over time. Most notably, this could involve the collection of information about small-scale photovoltaic systems (which is currently captured under the Small Scale Renewable Energy Scheme. See section 5.3 for more details).[19]

The COAG Energy Council did not propose specific changes to the rules or include drafting for a proposed rule. Instead, it highlighted aspects of the current regulatory framework which may require changes, and proposed potential solutions in general terms.

A copy of the rule change request can be found on the AEMC website, www.aemc.gov.au.

3.1 Issues identified by the COAG Energy Council

According to the COAG Energy Council, as installations of behind the meter batteries and other distributed energy resources are set to increase in the coming years, system management challenges and safety risks could also increase if information gaps about these installations are not addressed.

The COAG Energy Council noted Bloomberg New Energy Finance projections that 100,000 batteries could be installed by 2020, and one million by 2030.[20]

The rule change request cites three main problems, as identified by Jacobs[21] that can occur if current information gaps relating to small-scale batteries were to continue:[22]

- **Inefficient market and network investment** - due to overstated or understated demand forecasts that have not accounted for behind-the-meter battery storage.

18 Rule change request, cover page.

19 Rule change request, p. 1.

20 Bloomberg New Energy Finance, February 2017, cited in the rule change request, p. 3.

21 Jacobs, *Cost Benefit Analysis of options to collect and share information about small scale battery storage*, final CBA report, June 2017.

22 Rule change request, p. 6.

- **Inefficient market and network operation** - the market operator and distributors may not be able to develop reasonable estimates of short-term demand, making system control more difficult and expensive.

- **Safety risks to workers, installers and the general public** - due to emergency services and line workers or electricians not having adequate information on sites with a battery or other DER.

The COAG Energy Council noted AEMO's *Visibility of Distributed Energy Resources* report[23], which indicated that, in aggregate, DER could have a material and unpredictable impact on the power system unless information about deployments are available, making it more difficult for AEMO to undertake forecasting and manage the power system.[24]

3.2 Proposed solution

Bearing in mind the objectives, the COAG Energy Council described the solution as involving the following broad changes:[25]

- requiring AEMO to administer a register of DER

- establishing principles in the National Electricity Rules (NER) broadly defining how AEMO should determine the types and capacity of DER that should be included in the register, and allowing AEMO to use a guideline to specify the DER systems and data that should be collected

- establishing requirements in the NER that AEMO must follow to develop, maintain, publish and amend a guideline outlining the specific DER types to be included in the register and the required data sets

- allowing AEMO to share information in the register with appropriate parties, where there are recognised benefits for consumers in doing so

- requiring DNSPs to collect information about DER connected to their network, and provide this information to AEMO

- mechanisms or obligations on different parties to support the collection of information about DER at customer sites.

The COAG Energy Council indicated that the type of information envisaged to be collected could include a DER system's location, installation and decommissioning date, the system's capacity and technical characteristics (such as manufacturer, make, model number and inverter settings such as frequency and voltage trip settings).[26]

23 AEMO, *Visibility of Distributed Energy Resources*, January 2017.

24 Rule change request, p. 4.

25 Rule change request, p. 1.

26 Rule change request, p. 2.

3.3 Expected costs, benefits and impacts of the proposed rule

The COAG Energy Council indicated that the proposed changes will contribute to the achievement of lower costs, improved security and safety and more reliable supply outcomes through having greater visibility of behind the meter systems. In their view, it is expected that the register will contribute to:[27]

- improved efficiency of network investments
- better medium to long term network planning
- improved ability to manage power system security
- improved ability to respond to emergencies and contingency events.

According to the COAG Energy Council, the changes would do this by allowing DNSPs and AEMO greater visibility of DER on the network in order to better manage power system security and improve efficiency of investments in network assets and services. The COAG Energy Council expects that this will in turn provide benefits to consumers in the form of lower costs, as well as additional benefits for emergency services from having timely and accurate information when responding to an emergency incident where a DER is involved.

As explained above, a cost benefit analysis was commissioned by the COAG Energy Council and prepared by Jacobs (see Section 2.1.2). The analysis indicated a positive benefit-cost ratio for a register hosted by AEMO and using the DNSPs as the primary point of collection. Jacobs quantified benefits from more accurate forecasting through more efficient generation and network investment, and surmised qualitative benefits to market operation and safety.

The COAG Energy Council indicated that the following entities may be impacted as a result of the rule change request:[28]

- **AEMO** will be required to invest in the appropriate systems to develop and maintain a DER register, but the cost-benefit analysis suggests these costs will be more than offset by benefits generated through improved system management.
- **DNSPs** will have their ability enhanced to forecast peak demand and draw on demand response to manage constraints, delaying or avoiding unnecessary network investments.
- **End-use consumers** would receive flow-on benefits from more efficient operation of the electricity system through potential reductions in supply charges and see improved safety outcomes through information being available for emergency response, fire risk management, product safety recalls and proper disposal at end-of-life.

27 Rule change request, p. 13.

28 Rule change request, pp. 16-17.

- **Public sector stakeholders**: the availability of more reliable and complete information about the uptake of DER in Australia, which could lead to more informed policy decisions by governments to improve market and network efficiency.

- **Emergency services**: access to data on DER systems available from a register would enable emergency services to more accurately target a response knowing the location and type of DER involved in an emergency incident.

4 Assessment framework

The Commission's assessment of this rule change request must consider whether the proposed rule meets the national electricity objective (NEO) as set out in section 7 of the National Electricity Law (NEL) and the national energy retail objective (NERO) as set out in section 236(1) of the National Energy Retail Law (NERL). This chapter sets out the requirements under NEL and NERL that the Commission must satisfy in considering the rule change request, and provides detail of the proposed approach for assessing the rule change request.

4.1 Requirements under the NEL and NERL

4.1.1 Achieving the national electricity objective

Under the NEL the Commission may only make a rule if it is satisfied that the rule will, or is likely to, contribute to the achievement of the NEO.[29]

The NEO is:[30]

> "To promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to -
>
> (a) price, quality, safety, reliability and security of supply of electricity; and
>
> (b) the reliability, safety and security of the national electricity system."

4.1.2 Achieving the national energy retail objective

This rule change request also relates to aspects of the National Electricity Retail Rules (NERR), therefore the Commission may only make a rule if it is satisfied that the rule will, or is likely to, contribute to the achievement of the NERO.[31]

The NERO is:[32]

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

29 Section 88 of the NEL.

30 Section 7 of the NEL.

31 Section 236(1) of the NERL.

32 Section 13 of the NERL.

The Commission must also, where relevant, satisfy itself that the rule is "compatible with the development and application of consumer protections for small customers, including (but not limited to) protections relating to hardship customers" (the "consumer protections test").[33]

Where the consumer protections test is relevant in the making of a rule, the Commission must be satisfied that both the NERO test and the consumer protections test have been met.[34] If the Commission is satisfied that one test, but not the other, has been met, the rule cannot be made.

4.2 Proposed assessment framework

To determine whether the proposed rule change is likely to promote the NEO/NERO the Commission proposes to consider the following criteria as part of its assessment of the rule change request:

- ***Improve operation of the power system*** – the potential of the proposed rule change to better inform AEMO's operational decisions and processes relating to the efficient operation of the power system.
- ***Promote better investment decisions*** – the potential of the proposed rule change to better inform aspects of market participants' decisions-making to promote efficient investment and appropriate risk management.
- ***Regulatory and administrative burden*** – whether the cost of introducing a DER register is proportional to the costs of managing the issue it is trying to resolve.
- ***Clear roles and responsibilities*** – the degree to which the design of a DER register could allocate clear roles and responsibilities to promote effective implementation including appropriate compliance and enforcement functions.
- ***Balance information transparency and confidentiality*** – the degree to which a register could achieve an appropriate balance between information needs and confidentiality needs, including for:
  - AEMO to have access to the granularity and range of data it requires to improve the operation of the power system
  - other market participants to have access to an appropriate level of data to inform operational and commercial decisions
  - consumers to provide important information while their privacy is appropriately protected
  - the Australian Energy Regulator (AER) to have access to information to allow effective compliance monitoring and enforcement of relevant rules.

33 Section 236(2)(b) of the NERL.

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

- ***Compatibility with consumer protections*** – whether the development of a DER register is compatible with wider consumer protections and does not conflict with the development and application of relevant consumer protections for small customers in relation to confidentiality and privacy.

Issue 1 Assessment framework

1. Is the assessment framework appropriate for considering the proposed rule changes?

2. Are there other relevant considerations that should be included in assessing the proposed rule changes?

5 Issues for Consultation

Taking into consideration the assessment framework set out in Chapter 4, a number of issues have been identified for initial consultation.

This chapter provides background information and poses questions in order to gain feedback from stakeholders on the proposed changes in the rule change request, specifically:

- Section 5.1 discusses the expected benefits and costs of the register
- Section 5.2 discusses governance of the register
- Section 5.3 discusses data collection and compliance
- Section 5.4 discusses transparency and confidentiality issues
- Section 5.5 discusses safety issues, including the use of the register for emergency response.

The sections below are provided to help inform stakeholder responses to the rule change request, and are provided for guidance only. Stakeholders are encouraged to provide written submissions to the AEMC on them, as well as any other issues they consider relevant to the rule change request.

5.1 Expected benefits and costs of a register

5.1.1 Expected benefits

As outlined in Chapter 3, the COAG Energy Council expects the primary benefits of the proposed rule change to accrue through improving power system operation. These potential benefits are set out in further detail below.[35]

It is important to note that the materialisation of these benefits will depend on the types of systems and data that are collected by a DER register and the level of compliance, as discussed in sections 5.2 and 5.3.

Power system operation

If the uptake of distributed energy resources continues to expand, there is the potential for these devices to increasingly affect power system security at the transmission level and demand at the wholesale level.[36]

35 The COAG Energy Council also envisaged that a register would provide a range of secondary benefits, including: helping protect the safety of the public in the event of emergencies involving DER; and improving policy and market outcomes by providing access to aggregated information on DER to certain third parties.

AEMO is responsible for the operation of the NEM, and for maintaining NEM power system security. AEMO has noted that there are two broad areas where a lack of visibility of DER could directly impact on these functions. These areas can be split into:[37]

- load forecasting
- the response of load.

Load forecasting

Load forecasting is a crucial component of AEMO's day-to-day operation of the power system.[38] Load forecasting also plays an important role in short-term reserve management, and for infrastructure assessment and planning over the medium and longer term. To efficiently carry out these functions, AEMO needs to be able to predict the daily load profile, as well as how quickly demand will change, in addition to the minimum and maximum demand sought.

Historically, load forecasting has largely relied on the underlying diversity of consumer behaviour. This diversity means that not all appliances are used at the same time in the same ways.[39] AEMO says that the presence of diversity in the "passive" demand side has to date given it the ability to forecast aggregate demand with sufficient accuracy to operate the power system securely.

However, AEMO is concerned that a significant uptake of DER will change load behaviour and AEMO's subsequent ability to predict such behaviour. This is because some distributed energy resources are either undiversified, such as rooftop solar photovoltaic systems, or are less predictable in how they operate, such as battery storage.

AEMO argues that such features can, in aggregate, offset the underlying diversity in consumer demand and make load forecasting more challenging. Consequently, this could present challenges to AEMO's ability to carry out the functions listed above.

Response of load

AEMO has also noted that an understanding of how load, in aggregate, will respond to system disturbances is relevant to its ability to manage power system security.[40]

AEMO states that DER often behaves differently in response to power system disturbances to other household appliances. Because these devices are connected to the

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36 AEMC, *Distribution Market Model*, final report, August 2017, p. 16.

37 AEMO, *Visibility of distributed energy resources*, January 2017.

38 AEMO, *Visibility of distributed energy resources*, January 2017, p. 12.

39 For those devices that are used at the same time, e.g. air conditioners, AEMO has noted that use is correlated to external factors (such as weather patterns) and therefore can often be predicted.

40 AEMO, *Visibility of distributed energy resources*, January 2017, p. 16.

network via electronic inverters, they disconnect automatically if voltage or frequency reaches certain thresholds. This means that, unlike traditional appliances, their reaction to a system disturbance is a controlled outcome rather than a technical or mechanical characteristic.

Without visibility of how DER is pre-set to respond,[41] AEMO argues that the prudent course of action is for it to take a conservative approach. This affects the bounds of the technical envelope[42] on a day-to-day basis if the penetration of DER is large, making operation of the power system less efficient.

It also means that AEMO does not know how these devices will respond to extreme power system conditions, and whether they will present challenges for AEMO in managing the power system following non-credible or multiple credible contingency events, including increasing the risk of cascading outages leading to black system events.

How visibility might improve power system operation

To mitigate the above risks, the COAG Energy Council expects that a register of distributed energy resources would provide AEMO with more information to efficiently manage the balance of supply and demand in the National Electricity Market, and to plan against contingency events.

In particular, the COAG Energy Council envisions that AEMO could benefit from the improved **static** information about DER that a register could provide by:[43]

- having more information about load profile and response to better manage the system within the technical envelope, including scheduling generation, and managing voltage and contingency events
- having the necessary information to identify and respond to non-credible contingency and protected events, such as DER unexpectedly disconnecting at a certain frequency, and expected but rare events, such as extreme weather incidents and solar eclipses
- reducing the cost of frequency control ancillary services (FCAS), by improving forecasting and dispatch of FCAS.

Network security and operation

At low levels of penetration, distributed energy resources can be, and have been, accommodated within Australia's distribution networks with little to no coordination

41 This response can vary between manufacturers, or based on the different preferences of installers and owners.

42 The technical envelope is defined in clause 4.2.5 of the NER as the technical boundary limits of the power system for achieving and maintaining the secure operating state of the power system for a given demand and power system scenario.

43 Rule change request, p. 16.

or assessment of their cumulative impacts of the network. This is because networks generally have had spare capacity and are therefore able to adapt to the technical impacts of distributed energy resources.[44]

However, it is possible that distribution networks are likely to be increasingly affected by distributed energy resources if penetration levels increase. The AEMC has previously published a list of the potential technical impacts on distribution networks in our 2017 Distribution Market Model report.[45]

By allowing DNSPs greater visibility over the DER installed on their networks, the COAG Energy Council advocates that a register would help prevent negative impacts on network security, planning and operation from manifesting.[46]

In support of this argument, the Council referenced the 2017 Jacobs' cost-benefit analysis, which attempted to quantify the medium to long-term planning benefits to networks of a DER register. Jacobs' found that a register is likely to provide networks with an improved ability to forecast peak demand, which could consequently lead to greater efficiencies in the network augmentation expenditure.[47] This is because the presence of DER within a distribution network is likely to depress peak demand, forestalling the need for system augmentation.

In addition, the COAG Energy Council noted that DNSPs who participated in the September 2016 EMTPT battery storage consultation paper, as well as the 2017 cost benefit analysis report consultation, were generally supportive of a register.[48] Energex, Ausgrid, Ergon and Endeavour supported the view that a register would enable effective and safe planning, management and operation of the distribution network.[49] In addition to the planning benefits outlined above, Endeavour suggested that static information provided by a register could provide a better understanding of maximum demand and its effect on network cyclic ratings.[50]

Issue 2 Benefits of a register

1. What are the **likely uses** of a distributed energy resources register?
2. How, and to what extent, could the **static** information provided by a DER register meet the objectives outlined by the COAG Energy Council, namely:

44 AEMC, *Distribution Market Model*, final report, August 2017, p. 12.

45 AEMC, *Distribution Market Model*, final report, August 2017, p. 12.

46 Rule change request, p. 13.

47 Jacobs, *Cost Benefit Analysis of options to collect and share information about small scale battery storage*, final CBA report, June 2017, p. 54.

48 Rule change request, p. 16.

49 Submission to the EMTPT consultation paper: Ausgrid, p. 1; Energex, p. 1; Ergon pp.1-2; Endeavour Energy, Attachment A, pp. 1-2.

50 Submission to the EMTPT consultation paper: Endeavour Energy, Attachment A, pp. 1-2.

(a) **more accurate load forecasting**?

(b) **improving AEMO's ability to manage power system security** during credible contingency, protected and non-credible contingency events?

(c) improving AEMO's ability to **set the bounds of the technical envelope at an efficient level**?

(d) improving **efficient market and network investment**?

3. Are there any other ways that a distributed energy resources register could benefit the National Electricity Market?

4. What **features** does a register need to have in order to meet the objectives outlined by the COAG Energy Council?

5.1.2 Expected costs

The Commission considers that the most useful data is accurate, timely and universal. If a distributed energy resources register were to be established, collecting useful data is likely to be one of the key elements that determine its success.

As outlined in Chapter 4, one of the proposed assessment criteria for this rule change is to consider whether the cost of introducing a DER register is proportional to the issue it is trying to resolve. It is important that the register not impose an excessive regulatory or administrative burden on participants, as this may lead to unnecessary costs being passed onto consumers.

We understand that many stakeholders who participated in the September 2016 EMTPT battery storage consultation paper were of the view that the most cost-effective way to obtain useful information may be to collect it when DER devices are being installed.[51] If this avenue were pursued, potential costs might include developing a new app or introducing a new process to improve data collection from installers.[52]

The Jacobs cost benefit analysis report, published in June 2017, noted that there is an opportunity to improve consistency and efficiency of data collection requirements across DNSPs (through a new fit for purpose app), resulting in a more streamlined process and time savings.[53] The costs estimated by Jacobs included the development of this app and the time savings from its use.

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51 Submission to the EMTPT consultation paper: AGL, p. 3; Clean Energy Council, p. 3; Energy Consumers Australia, p. 7; Endeavour Energy, p. 3; Energy Networks Association, p. 6; Dr Penelope Crossley, p. 12.

52 See section 2.1.2 for potential data requirements.

53 Jacobs, *Cost Benefit Analysis of options to collect and share information about small scale battery storage*, final CBA report, June 2017, pp. 21;33.

Jacobs' CBA report evaluated the potential costs associated with establishing a DER register.[54] The table below summarises the costs that Jacobs envisioned would occur if AEMO were to administer a register of DER data provided by DNSPs, with installers as the primary source of information.

Table 5.1 Total cost summary

Cost (present value)	Assumptions (AEMO host)
Initial hardware development or adjustment costs	$0.74m
Data collection systems development	$0.24m
Ancillary database adjustment costs	-
Policy and design consultation	$0.57m
Operation and maintenance	$0.74m
Data collection costs	$6.97m
Data validation and auditing	$1.41m
Total cost	**$10.67m**

Issue 3 Expected costs

1. What costs do you believe would likely be involved in the collection of useful data about DER?
2. Do you agree with the costs identified by Jacobs for different stakeholders? If not, why?
3. Are stakeholders able to provide data or case studies that would support further quantification (in monetary terms) of any of the likely costs?
4. How might the nature and magnitude of these potential costs change over time?

5.2 Governance

Important considerations for the Commission will include:

1. which party is accountable for the management of the register

54 Jacobs, *Cost Benefit Analysis of options to collect and share information about small scale battery storage*, final CBA report, June 2017, pp. 45-49.

2. how the types of DER systems that are included in the register and the information that is required to be reported on those systems are determined

3. what scope of powers is given to the party managing the register.

5.2.1 Management of the register

As noted in Chapter 3, the proposed rule change seeks to create an obligation on AEMO to administer the register of distributed energy resources. Stakeholders' submissions to the 2016 EMTPT consultation paper were generally supportive of a register hosted by an existing national body, with some favouring AEMO and others the CER.[55] As discussed in Chapter 2, Jacobs' 2017 cost-benefit analysis report found a positive benefit-cost ratio for a register hosted by either body.

5.2.2 Type of systems to be included in the register

An important governance consideration will be what types of DER systems are included in the register, which systems are exempt from registration, and how are those decisions made.

The proposed rule change seeks to improve the visibility of small-scale behind the meter DER in the NEM. The COAG Energy Council has outlined that it intends for the register to include behind the meter DER that will materially affect patterns of electricity production and consumption at a customer's premises.[56]

It is important to note, however, that 'small-scale', 'behind the meter' and 'distributed energy resources' are not defined in the proposed rule change, nor in the NER or NERR. The Commission will need to consider how these terms should be defined; specifically, whether they are prescribed within the Rules or delegated to another body, such as the administrator of the register, to specify through procedures or guidelines.

The COAG Energy Council has proposed that AEMO should be allowed to specify the types of DER that are subject to registration. Under the proposed rule, AEMO would be required to consider principles set out in the NER, and undertake a consultation process with stakeholders, when developing guidelines that specify the types of information on distributed energy resources that is collected and recorded.

An understanding of what these terms are intended to capture is also needed to assess the potential benefits and costs of the data to be collected and then for incorporation into the rules, as appropriate. The concepts are elaborated on below.

55 Examples of submissions to the consultation paper that favoured the CER include the Clean Energy Council and ANU Energy Change Institute. Examples that favoured AEMO include Red Lumo, Energy Consumers Australia and King & Wood Mallesons.

56 Rule change request, p. 11.

Small scale

The COAG Energy Council has suggested that 'small scale' should, at minimum, be understood as a range of generation systems below 5 MW in size.[57] This is because AEMO currently exempts generators with a capacity of 5MW or less from needing to register as a generator in the NEM, and visibility over these systems is low.[58]

Apart from the 5 MW threshold, the COAG Energy Council has intentionally left the definition of 'small scale' open to be determined by the AEMC during the rule change process, or by AEMO during any subsequent consultation that may result if AEMO were empowered to set guidelines determining the nature of eligible DER.[59] Stakeholder views are sought on what an appropriate size range may be for inclusion in the register, weighing the additional costs of data collection against any benefits that may result from collecting the information.

Behind the meter

In *Contestability of energy services final determination*, published by the AEMC on 12 December 2017, the Commission considered a range of options for the spatial specification of 'behind the meter' or similar concepts. In that context, the Commission considered that the clearest approach was to use the connection point instead of the meter as the relevant spatial reference, and refer to equipment that is electrically connected to the network on a retail customer's side of the connection point.[60]

Connection point is defined in the NER as the agreed point of supply established between the NSP(s) and another registered participant, non-registered customer or franchise customer.[61] More generally, the connection point is commonly the point where responsibility for supply transfers from the DNSP to the customer and therefore represents the most logical boundary for the end of DNSP control and investment in assets.

While the current NER definition does not provide for a uniform point of connection for all customers, the Commission understands that the location of the connection point is generally established under connection contracts and that in many jurisdictions the exact location of the connection point for different customer types and situations is defined through jurisdictional instruments.

Stakeholder views are sought on what an appropriate spatial specification of DER equipment to be included in the register is, noting that the COAG Energy Council has

57 Rule change request, p. 1.

58 AEMO, *NEM Generator Registration Guide*, August 2016, p. 25.

59 Rule change request, p. 1.

60 AEMC, *Contestability of energy services*, final determination, December 2017, p. 54.

61 NER Chapter 10, definition of 'connection point' refers to networks other than embedded networks.

indicated a preference for information about small retail customers to be captured (i.e. residential households and small businesses).[62]

Distributed energy resources

Depending on the interpretation, DER can include a wide range of technologies such as solar photovoltaic devices, combined heat and power or co-generation systems, micro-grids, wind turbines, micro-turbines, back-up generators and energy storage.

Demand response or energy efficiency are also sometimes characterised as DER, given that they could in some circumstances have the same value as injecting power into the network.[63] However, these forms of DER may not be suitable for inclusion in a register if they do not constitute a distinct piece of energy equipment.

The Commission has previously defined distributed energy resources in its *Distribution Market Model* report as "an integrated system of energy equipment co-located with consumer load".[64] This definition encompasses both 'smart' devices (i.e. devices that have the ability to respond automatically to short-term changes in prices or signals from wholesale markets or elsewhere in the supply chain) as well as 'passive' devices (for example, a rooftop solar PV system that generates and feeds power into the grid when the sun shines).

One advantage of the definition above is that is technology-neutral, which could be important given the rapid pace of change in the DER sector. In its *Visibility of distributed energy resources report*, AEMO emphasized the importance of developing a framework that could be easily applied to new technologies subject to mass-market uptake, given their potential impacts on power system operation.[65]

5.2.3 Type of information to be included in the register

The COAG Energy Council has proposed that the NER be amended to allow AEMO to use a guideline to specify the data that should be collected, subject to requirements set out in the NER. Box 5.1 below summarises the type of DER information that AEMO has previously indicated it may need to improve power system operation. Other information may be required for the purposes of power system security or to address safety concerns.

62 Rule change request, p. 2.

63 KPMG, *Distribution Market Models - Preliminary assessment of supporting frameworks*, Report for the Australian Energy Council, June 2017, pp. 6-7.

64 AEMC, *Distribution Market Model*, final report, August 2017, pp. 4-5.

65 AEMO, *Visibility of distributed energy resources*, January 2017, pp. 40-41.

Box 5.1 Overview of AEMO's needs

- **Location:** AEMO stated it that would require information about each installation at the National Metering Identifier (NMI) level, as:
  - Each installation has unique properties that need to be considered when aggregated to the transmission connection point. AEMO noted that NMI information is preferred over postcode data because postcodes do not always map to a single connection point.
  - It provides a way to identify "those DER participating in providing services and that will be captured in the Demand Side Participation (DSP) guidelines".[66] AEMO noted that providing services (e.g. ancillary services and load shifting to support the management of power system operations) will change how the DER operate, and hence how they need to be forecast.
  - AEMO also noted that "disaggregated data also allows [it] to determine the locational drivers that couldn't otherwise be considered".[67]
- **Capacity:** The capacity of DER is important to forecast generation and load shifting.
- **Technical characteristics:** AEMO has stated that technical characteristics are most important for the inverters interfacing with the network, because these will determine the response to system disturbances.
  - Technical characteristics include the electronic settings such as frequency and voltage trip settings, as well as other modes that may be enabled.
  - AEMO has argued this data cannot be aggregated as it will be unique to each individual DER, and these characteristics are vital inputs into power system stability studies.

Source: AEMO, *Visibility of distributed energy resources*, January 2017, pp. 35-36.

5.2.4 Scope of the rules and guidelines

In its assessment of the solution proposed by the COAG Energy Council, the Commission will need to determine what matters need to be included in the rules and what issues should be set out in AEMO guidelines regarding the content and operation of the DER register.

66 AEMO, *Visibility of distributed energy resources*, January 2017, p. 35.

67 AEMO, *Visibility of distributed energy resources*, January 2017, p. 36.

The National Electricity Rules generally set out a framework, such as prescribing the governance of the register, the rights and obligations of various participants involved in the collection and use of the data, and guidance on how guidelines are developed. Guidelines can be better suited to governing any matters that could evolve over time, for example, as technology changes or as the market for DER develops.

It will also be important to consider the nature of any principles introduced in the rules, as well as the extent that AEMO must consider those principles. Under the proposed rule, AEMO would be required to consider principles set out in the NER, and undertake a consultation process with stakeholders, when developing guidelines that specify the types of information on distributed energy resources that is collected and recorded.

Examples of principles that could be enshrined in the rules may include a provision for AEMO to: (1) have regard to the reasonable costs of compliance with the register compared to the likely benefits from the use of the information gathered; or (2) periodically report on the benefits of the information it has received from the register.

Issue 4 Governance framework for the register

1. Please comment on the suitability of the following:
   (a) Should '**small scale**' systems be limited to generation systems below 5 MW? Should any further limitations be imposed (e.g. a minimum capacity or a threshold in MWh for energy storage)?
   (b) Is the NER definition of '**connection point**' an appropriate spatial demarcation for 'behind the meter' DER? If not, what is an appropriate spatial demarcation for '**behind the meter**' DER?
   (c) Is a '**distributed energy resource**' "*an integrated system of energy equipment co-located with consumer load*"? If not, what else could it be characterised as?
2. Regarding the management of a DER register:
   (a) To what extent should the types and capacity of DER eligible for inclusion in the register be defined in the NER or in an AEMO guideline**?**
   (b) Should the nature of the information being collected and recorded in the register and any other requirements, such as how often parties need to report the data, be determined in an AEMO guideline?
   (c) What types of principles, factors or other criteria should AEMO be required to consider when developing guidelines on the collection and recording of information on DER?

5.3 Data collection and compliance

The COAG Energy Council noted in its rule change request that the biggest barrier to data collection for the purposes of a register is the limited recording of small-scale DER, including batteries, under the current Rules.[68]

This section provides an overview of the current arrangements in place to collect data on behind the meter DER installations, and the issues that would need to be resolved in order to collect a comprehensive set data for the proposed register.

It is important to note that, for brevity, we have limited the discussion of current data collection arrangements to small-scale behind the meter battery storage and solar PV systems given the rule change request is focussed on these systems.[69]

5.3.1 Current sources of information and their limitations

The COAG Energy Council indicated that even though there are currently mechanisms that collect some information on behind the meter DER, there are gaps in those mechanisms.[70]

Table 5.2 below provides a summary of the existing mechanisms in place that collect data related to small-scale behind the meter DER, the data collection process, the compliance requirements and challenges and also the limitations of each mechanism:

- Small-scale renewable energy scheme
- DNSPs' connection application process
- AEMO's demand side participation guidelines.

68 Rule change request, p. 6.

69 Rule change request, pp. 1-2.

70 Rule change request, p. 2.

Table 5.2 Current sources of information and their limitations

Mechanism	Data collection	Compliance	Key limitations
Small-scale renewable energy scheme(SRES) *(Clean Energy Regulator)*	• Customers, or their agents, are required to fill in a range of documents and submit to the CER. • It is mandatory for consumers to register their systems with the CER in order to receive incentives under the SRES. • The CER already collects some information about battery storage systems included in the installation of small-scale generation units, but this information is provided voluntarily.	• The CER has the right to impose penalties on individuals who provide false or misleading information which results in the improper creation of small-scale technology certificates. • The CER conducts annual audits to confirm compliance of registered systems with the legislation. Some audits are also conducted where there is evidence of non-compliance.	• Only systems <100 kW are required to register. • Battery storage systems and components are not eligible to participate in the scheme, however, approved systems with an integrated battery could be.[71] • Data may not be collected or maintained once the SRES scheme ends in 2030. • Systems can be registered up to 12 months after installation, meaning that there can be a time lag in the information contained in the database. • It is not under the framework of the NEL/NERL.
Connection application process *(DNSPs)*	• Before installing solar PV panels and batteries at a business or residence, the consumer must gain permission from their local	• The regulatory framework for small loads and generating systems connecting to a distribution network is set out in	• Low levels of compliance • DNSPs vary as to the level and type of data collected on DER, and how it

71 Clean Energy Regulator, viewed 9 February 2018, http://www.cleanenergyregulator.gov.au/RET/Scheme-participants-and-industry/Agents-and-installers/Small-scale-systems-eligible-for-certificates

Mechanism	Data collection	Compliance	Key limitations
	DNSP to connect to the network by making a Network Connection Application. • Once submitted, the DNSP will conduct a network technical assessment to determine the impact of the solar power installation on the network, and the size of the system the applicant may connect. • Consumers (or their agents) need to provide certain information about proposed embedded generation, including type, size, make and model. • In theory, static information about the location and technical characteristics of distributed energy resources should therefore already be captured by DNSPs when they process a new connection.	Chapter 5A of the NER. • Some DNSPs have raised concerns that consumers (or their agents) do not always inform them of new connections or modifications to existing connections. • On average, only 30% of battery systems are being detected through the existing connection process. Jacobs carried out a survey with DNSPs, which indicated that this value can range from 5% to 50% depending on the DNSP.[72]	is stored and used, creating inconsistencies across the NEM[73] • Some DNSPs have a threshold under which systems are automatically pre-approved for connection to the network (usually less than 5 kW). The threshold differs between DNSPs and depends on the type of line a customer is connected to.[74] • There is currently no obligation under the NER for DNSPs to collect and share specific technical data about DER systems with AEMO for the purposes of system security.
Demand side participation guidelines	• The guidelines require registered participants to submit their DSP data annually, with the first	• Clause 3.7D(b) of the NER requires all registered participants to provide DSP	• DER that are not involved in DSP will not be captured

72 Jacobs, *Cost benefit analysis of options to collect and share information about small-scale battery storage*, final CBA report, June 2017, p. 20.

73 Rule change request, p. 5.

74 AEMC, *Distribution Market Model*, final report, August 2017, p. 45.

Mechanism	Data collection	Compliance	Key limitations
(AEMO)	submission scheduled to occur in April 2018. • Each registered participant is required to provide information at the National Metering Identifier (NMI) level. This is to enable AEMO to reconcile the DSP information provided in accordance with the guidelines with other data sources, such as metering and pricing databases, to assess the accuracy of the data provided.	information to AEMO in accordance with the guidelines. • The obligation imposed on registered participants by the guidelines is to provide data that is obtainable under their current business processes.	• The DSP guidelines only apply to registered participants • AEMO is only allowed to access information for load forecasting purposes. There is no ability to collect information for understanding the load response to system disturbances, or power system security studies more generally.[75]

A more comprehensive overview of such mechanisms can be found in Appendix B.

75 AEMO, *Visibility of distributed energy resources*, January 2017, p. 22.

5.3.2 Addressing limitations in data collection and compliance

As set out above, there are a number of limitations to existing arrangements to collect data on small-scale DER. Many of these limitations will be equally applicable to the proposed register and will need to be addressed if an effective DER register is to be established.

The COAG Energy Council has proposed that DNSPs collect information about DER at customer sites and report this to AEMO for the register. They have also proposed some potential steps for consideration that support the collection of this information and address some of the current limitations in DNSPs connection application process identified above, including:[76]

- "amending the Rules around connection agreements to clarify the situations when customers and their agents / suppliers (such as a retailer and/or an installer/ electrician) need to inform their DNSP about changes at their sites, including DER installations"
- DNSPs applying "random auditing protocols on premises / DER systems, and referral to the appropriate body for enforcement where non-compliance is identified"
- changes to the NERR "relating to the relationship between distributors, retailers and customers, and deemed standard connection contracts"
- a mechanism or obligations on other parties so that "any changes to DER post installation are captured, such as potential system changes by retailers or aggregators".

The COAG Energy Council proposes that customers who are the owners of DER systems (or their agent) should be obliged to provide information on the DER system to their DNSP.[77] The COAG Energy Council does not discuss how such obligations on individual consumers would be enforced.

The COAG Energy Council also states that the measures above "should not preclude jurisdictions from using electricity safety, licensing and/or other methods, such as links to training and skills competencies, to support data collection by installers and electricians and the provision of this data to DNSPs".[78] They note that other measures may be needed to support compliance, such as raising the DER industry's awareness of the requirements."[79] They note that these types of measures will need to be considered

76 Rule change request, p. 12.

77 Rule change request, p. 3.

78 Rule change request, p. 12.

79 Rule change request, p. 3.

separately by governments; however they would welcome recommendations from the AEMC on supporting compliance with the rules.[80]

Obligations on one or more parties may need to be considered in order for a DER register to collect a sufficient amount of data.

A wide range of parties hold information on installations of DER including: battery or inverter manufacturers; equipment retailers; installers; solar and battery system designers, registered small generator aggregators; embedded network service providers; DNSP; metering coordinators; energy retailers; customers; safety regulators; electricians and the Clean Energy Regulator.[81]

Each of these parties could potentially assist to collect and report data; however their ability to provide the appropriate data and the cost of reporting will vary. Placing obligations on a large number of different parties is also likely to result in overlapping reporting and unnecessary costs.

Placing enforceable obligations on some of these parties may not be possible under the NER or NERR and is likely to require changes to national or jurisdictional regulation outside of national energy regulation. For example, there are no precedents for the NER or NERR imposing obligations on electricians, and effective enforcement by the AER of new obligations imposed on electricians or individual customers may not be possible.

Regardless of who is collecting and reporting data for a register, it is likely that incentives and/or penalties would need to be introduced to achieve an appropriate level of compliance. Obligations on some parties may be easier to enforce than those on others. It may be challenging to achieve close to one hundred per cent compliance and stakeholders should consider how incomplete data will affect the benefits of the register.

Changes in technology may also influence compliance with reporting obligations. For example, monitoring devices on inverters may be able to automatically report data, or on the other hand, some battery systems (e.g. plug and play systems are under development) may be able to be installed without an electrician.

Taking into consideration the limitations and compliance challenges around the existing data collection mechanisms, and the obligations that might need to be imposed on various parties, stakeholders' views are sought on how data collection and compliance issues should be dealt with if a national DER register is created.

80 Rule change request, p. 13.

81 The Clean Energy Regulator currently shares information with AEMO on DER.

Issue 5 Data collection and compliance

1. How often does the data need to be **collected and updated** to achieve the objectives of a DER register?
2. Do you agree that there is a **need for consistency across network regions** in what data should be collected?
3. If DNSPs' connection application processes are considered a good method of collecting data, **what changes are needed to existing processes**?
4. Should **obligations on parties other than DNSPs** be considered to support data collection? If yes, **which parties are best placed** to collect and report this data?
5. How would an **obligation on the parties** identified above best be applied and enforced? Please provide details.
6. Will a register be beneficial if the levels of compliance in relation to providing information are similar to the **low levels of compliance** with the DNSP connection application processes? What levels of compliance are needed?
7. How else can **compliance levels be improved**?
8. How can compliance best be maintained over time as **technology changes**?

5.4 Transparency and confidentiality

The objective of this section is to understand stakeholders' views on any transparency and confidentiality issues that may arise as a consequence of establishing a DER register.

- Section 5.4.1 discusses the proposal to share information with third parties
- Section 5.4.2 discusses AEMO's current ability to share data
- Section 5.4.3 discusses potential privacy concerns
- Section 5.4.4 discusses AEMO's cyber security protocols

5.4.1 Proposal to share information with third parties

The proposed rule change seeks to allow AEMO to share information in a DER register with third parties, subject to existing privacy laws. These parties are listed as including both registered participants, such as DNSPs and retailers, and a range of other parties.

The intent of the rule change proposal is that where parties can use the data in the DER register to provide benefits to customers, such as more efficient market and network operation or improved safety, this would justify access to data at an appropriate level of aggregation and anonymity.[82]

In particular, the COAG Energy Council has suggested a list of stakeholders who could benefit from access to the DER register which includes:[83]

- emergency services, where data could assist with effective responses to emergency events on sites with a battery storage device or other DER
- public sector bodies, where aggregated data could lead to more informed policy decisions and improved market and network efficiency
- private sector entities, where data could promote innovation and make it easier to conduct DER product recalls.

These potential benefits need to be balanced against the costs of providing the information to such parties, as well as privacy concerns. Participants that are not registered with AEMO might need to pay a fee in order to have access to the data, and AEMO would take that into consideration when designing the cost-recovery framework for the register. As part of the rule change process, the Commission will need to consider the nature and scope of rights to access and disclose the information contained in a DER register and whether certain energy specific requirements are needed to complement existing laws and regulations (such as privacy laws).

5.4.2 AEMO's current ability to share data

Under Part 5, Division 6 of the National Electricity Law, AEMO has certain obligations with regard to the use and disclosure of protected information. For the purposes of the NEL, 'protected information' is information given to AEMO in confidence or in connection with the performance of its statutory functions and classified under the NER or the regulations as confidential information.

Section 54FA of the NEL authorises AEMO to disclose information in aggregated form given to it in confidence.[84] In the rule change request, the COAG Energy Council suggested that this provision would permit the disclosure of data from the register to bodies such as to policy-makers, researchers, consultants and other market participants or investors if done in aggregated form. However, the COAG Energy Council noted that aggregated data would not cover the needs of emergency services, since emergency response requires detailed information about the affected site. This

82 Rule change request, pp. 11-12

83 Rule change request, pp. 17-18.

84 More specifically, it permits the disclosure of such information if in a form that has been combined or arranged with other information so that it does not reveal any confidential aspects of the information.

provision would also not permit disclosure to a number of the other potential users proposed above who would require data about individual DER installations.

Section 54G of the NEL authorises AEMO to disclose protected information if the disclosure is necessary for the safety, reliability or security of the supply of electricity or the national electricity system. In the rule change request, the COAG Energy Council asked the AEMC to consider whether this section would permit the sharing of register data with DNSPs and emergency response agencies in certain circumstances. The Commission will consider the operation of this provision in the context of the rule change request.

5.4.3 Privacy issues

The rule change request also notes that another important consideration may be the collection, use and disclosure of 'personal information' under the *Privacy Act 1988*, to which AEMO is also subject.[85] In particular, AEMO must comply with the Australian Privacy Principles (APPs) as set out in Schedule 1 to that Act. The APPs set out how entities must deal with personal information, including its collection, use and disclosure.[86]

The COAG Energy Council noted in the rule change request that some of the information that may be collected, used and disclosed by AEMO for the purposes of the DER register could constitute personal information within the meaning of the Privacy Act (for example, a retail customer's name, address or phone number). It is the Council's view that the APPs would not prevent the implementation of the DER register as proposed.

More broadly, several stakeholders raised privacy concerns as part of the 2016 EMTPT consultation into a battery register.[87]For example, Dr Penelope Crossley noted that the amount of data made available to energy retailers or insurance companies should be limited to prevent market abuse. She also suggested there should be an established process for consumers to access and correct their own data, without needing to submit a Freedom of Information request.[88]

5.4.4 Cyber security

According to AEMO's *Guide to electricity information systems*, all data submitted to AEMO or generated by AEMO is permanently stored in secure databases and AEMO

85 Rule change request, pp. 9-10.

86 'Personal information' means information or an opinion about an identified individual, or an individual who is reasonably identifiable: a) whether the information or opinion is true or not, and; b) whether the information or opinion is recorded in a material form or not.

87 Submissions to the consultation paper: AESA, p. 2; Electrical Trades Union of Australia, p. 2; Dr Penelope Crossley, p. 15; Public Interest Advocacy Centre, p. 2.

88 Dr Penelope Crossley, *Submission on the Energy Storage Registration Consultation Paper*, 20 September 2016, Sydney, p. 16.

has implemented electronic, physical, and administrative safeguards that provide a high level of data security.[89]

These safeguards are designed to prevent unauthorised access to system data and to maintain the confidentiality of all participant information. They include:

- passwords to authenticate participant users that must be changed regularly
- the use of secure communication channels for exchanging secure data with authorised data users and providers
- authentication before access to data is granted to a person or system
- controls to prevent system users with access to system application logic (programs) from unauthorised modification of associated application data
- an audit system that tracks all changes to system data and records what data was changed, when it changed, and who made the change.

In addition, system integrity is protected through disaster recovery measures, which include hardware redundancy, systematic data backup and restoration, and the mirroring and replication of data on geographically separated data storage and processing system.[90]

However, AEMO's current systems do not generally contain customers' names.

Issue 6 Sharing data and privacy issues

1. Given the nature of information that may be required to be provided by registered participants under the proposed rule change, **are existing regulatory arrangements** (such as the protected information provisions under the NEL and Privacy Act 1988) regarding the collection and disclosure of **information adequate to protect** market participants and consumers whose DER systems are included in the register?
2. If not:
   (a) What are the likely nature, and magnitude, of **potential consequences of insufficient protection** of such information?
   (b) Should the NER limit, on the basis of confidentiality concerns, the information that registered participants or others would be required to provide to AEMO under the DER Register Guidelines? If yes, how?
   (c) Should the NER limit, on the basis of confidentiality concerns, how AEMO may use or disclose information provided to it under the DER

89 AEMO, *Guide to electricity information systems*, October 2017, pp. 35-36.

90 AEMO, *Guide to electricity information systems*, October 2017, p. 36.

Register Guidelines? If yes, how?

3. Are there any **competition concerns** raised by the establishment of the register?

5.5 Safety issues and emergency response

The COAG Energy Council's proposed rule change considers safety as a secondary objective of the DER register. The rule change request suggests that a register would help protect the safety of consumers, workers and first responders in the event of emergencies involving DER affected by fire, floods or other extreme conditions.

This section provides an overview of the Commission's consideration of safety in the context presented in the rule change request and seeks stakeholder feedback on the benefits of sharing data collected through a register in the event of an emergency.

5.5.1 Commission's safety considerations

The Commission considers that safety of the energy markets and the public is an important consideration of the various energy market objectives that it operates under. However the national electricity objective/national electricity retail objective refers to safety in the context of the power system being safe if is maintained and is operating in a secure condition. The safety of the power system is linked to the security of the power system and relates primarily to the operation of assets and equipment within their technical limits. The Commission is not able to directly consider issues involving safety in the context of emergency services.[91]

The regulation of electrical safety and emergency response matters falls within the remit of jurisdictional departments or jurisdictional safety regulators in each state and territory. State and territory legislation governs the safe supply of electricity by network service providers and the broader safety requirements associated with electricity use in households and businesses. Appendix C[92] provides an overview of the safety framework for each jurisdiction. Jurisdictions have specific provisions that explicitly refer to the safety duties of networks, as well as other aspects of electricity systems such as metering and batteries.

Australian Standards also outline technical, building and safety standards for electricity storage devices and their installation. While the use of all Australian standards is generally voluntary, Australian standards set fundamental parameters for how distributed energy resources can be installed and operated.[93] In 2016 Standards Australia, in collaboration with Energy Networks Australia, launched a work plan for improving Australian standards to support a future with distributed energy resources.

91 For example first responders and fire services.

92 Reliability Panel, *Annual market performance review 2016*, Final report, 16 May 2017, Appendix H.

93 Compliance with Australian Standards can be required through requirements of safety regulators, AEMO procedures or DNSP connection agreements.

Standards Australia adopted the product standard for battery storage in December 2017. This standard covers safety requirements for batteries for use in stationary and mobile applications as well as applied to residential and commercial battery systems.[94] Standards Australia is also currently consulting on the future development of onsite battery storage standards in Australia, including safety elements of battery storage.[95]

The Commission does not directly consider issues involving safety in the context of emergency services, however it recognises that safety of the public is an important consideration and therefore proposes to consider how the sharing of information collected by a DER register could be facilitated if evidence suggests it would be useful.

5.5.2 Safety issues

In November 2015, the Clean Energy Council (CEC) commissioned CSIRO to prepare an *Energy storage safety* report. Key findings of the report suggest there is a lack of knowledge on the variety of emerging storage technologies including how to operate and maintain them in a safe manner.

CSIRO found limited examples of safety incidents involving energy storage systems in Australia and instead highlight US examples of incidents involving storage safety particularly in the aviation industry.[96] It recommends that industry develop a best practice initiative to report energy storage installations and incidents.

Another area examined in the report is emergency response teams limited knowledge of issues related to energy storage that could arise in the event of an emergency. The report recommends that relevant safety signage needs to be displayed for the response team to take account of the location of the battery.

CSIRO also considered there was a need for Australian standards to be updated to account for the changing profile of emerging technologies.

The COAG Energy Council EMTPT consulted on the merit of a register providing a benefit to emergency responders. There were a number of submissions that provided feedback on this issue:

- Victoria Safety's submission suggests that safety is the primary role of standards and state regulation. It considers that the Australian standard for storage system installation AS/NZS 5139 which is currently being consulted on will assist with improving safety of storage systems by requiring premises with storage systems to have signage showing the type of battery installed and the location of the

94 Standards Australia, *Media Release: Australia adopts international product standard for battery storage,* 13 December 2017.

95 Standards Australia, *Media Release: Future development of onsite battery storage standards in Australia,* 18 August 2017.

96 CSIRO (2015) *Energy Storage Safety Study: Report for the Clean Energy Council*, p. 33.

battery.[97] Victoria Safety considers this should provide adequate information for emergency workers and tradespeople attending site.

- S&C Electric considers that while batteries, including Lithium ion batteries, represent a very low fire risk, that is, they rarely initiate a fire, there is a much higher risk that batteries will become engaged in a fire that was ignited from a different source, such as a bushfire.[98]

- S&C Electric also point to the Australian Standard AS/NZS 5139 to address issues around ensuring that the enclosure of any domestic-scale battery system is appropriately rated to ensure that the batteries within are protected from an external source of fire.

5.5.3 Sharing of information

The rule change request considers a secondary objective of a register would be to help protect the safety of consumers, workers and first responders in the event of emergencies involving DER affected by fire, floods or other extreme conditions.

Submissions to the EMTPT process have varied views on the benefits associated with emergencies services having access to a DER register, for example:

- The Australian Energy Council (AEC) considers that first responders manage comparable risks around hazardous equipment at premises, such as stored liquid fuels, chemicals and LPG canisters without registries. A more pragmatic approach may be signage obligations at property access points.[99]

- The Energy Storage Council considers that emergency services need to know if a battery storage system has been installed at a premise when they are responding to a fire, whether or not the fire has anything to do with the battery storage system.[100]

- EWON also believes that for emergency responders, having installation information and therefore correct equipment available is vital as it will contribute to greater safety and more efficient responses to emergencies.[101]

5.5.4 Promoting safety

Section 54G of the NEL allows AEMO to disclose protected information if, among other things, it is necessary for the safety of the supply of electricity or the safety of the national electricity system.

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97 Energy Safe Victoria, *Submission to national battery storage register consultation*, 9 June 2017, p. 1.

98 S&C Electric, *Submission to national battery storage register consultation*, 9 June 2017, p. 4.

99 Australian Energy Council, *Submission to national battery storage register consultation*, 8 June 2017, p. 2.

100 Energy Storage Council, *Submission to national battery storage register consultation*, 9 June 2017, p. 1.

101 EWON, *Submission to national battery storage register consultation*, 8 June 2017, p. 2.

As previously described in Section 5.4.1, the COAG Energy Council has asked the AEMC to consider whether section 54G of the NEL may facilitate the achievement of the policy intention to share DER-related data with DNSPs and emergency response agencies in some circumstances.

While the safety aspects outlined in the proposed rule change are outside the Commission's consideration, it recognises that sharing of this information may improve the safety of consumers, workers and first responders in the event of emergencies involving DER. The Commission requests stakeholders to provide feedback on how the sharing of information would be useful and how it could be promoted.

Issue 7 Safety issues and emergency response

1. Would the sharing of data collected under a DER register be **useful to emergency services**, and if so, how?
2. Are there existing mechanisms currently in place (e.g. requisite IT systems) that could **facilitate the practical sharing of data** with emergency responders on a real time basis?
3. Is the proposed DER register the **most practical mechanism** to provide emergency services with the required information?
4. What **important features** does a register need to have in order to meet the needs of emergency services?
5. To what extent is energy related information **already shared between relevant bodies** (e.g. AEMO/CER) to emergency services for safety reasons?

6 Lodging a submission

The Commission has published a notice under s.95 of the NEL and s.251 of the NERL for this rule change proposal inviting written submission. Submissions are to be lodged online or by mail by **17 April 2018** in accordance with the following requirements.

Where practicable, submissions should be prepared in accordance with the Commission's Guidelines for making written submissions on rule change requests[102] The Commission publishes all submissions on its website subject to a claim of confidentiality.

The AEMC developed a template to enable stakeholders to provide their feedback on the questions posed in this paper and any other issues that they would like to provide feedback on. The AEMC encourages stakeholders to use the template to assist it to consider the views expressed by stakeholders on each issue. Stakeholders should not feel obliged to answer each question, but rather address those issues of particular interest or concern.

All enquiries on this project should be addressed to Daniela Moraes on (02) 8296 0607.

6.1 Lodging a submission electronically

Electronic submissions must be lodged online via the Commission's website, www.aemc.gov.au, using the "lodge a submission" function and selecting the project reference code **ERC0227/RRC0011**. The submission must be on letterhead (if submitted on behalf of an organisation), signed and dated.

6.2 Lodging a submission by mail

The submission must be on letterhead (if submitted on behalf of an organisation), signed and dated. The submission should be sent by mail to:

Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

The envelope must be clearly marked with the project reference code ERC0227/RRC0011.

102 This guideline is available on the Commission's website www.aemc.gov.au

Abbreviations

AEC	Australian Energy Council
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
APPs	Australian Privacy Principles
CBA	cost-benefit analysis
CEC	Clean Energy Council
CER	Clean Energy Regulator
COAG Energy Council	Council of Australian Governments Energy Council
Commission	See AEMC
CSV	Comma Separated Values
DER	distributed energy resources
DNSPs	distribution network service providers
DSP	demand side participation
EMTPT	Energy Market Transformation Project Team
FCAS	frequency control ancillary services
NEL	National Electricity Law
NEM	National Electricity Market
NEO	National electricity objective
NER	National Electricity Rules
NERL	National Energy Retail Law
NERO	National energy retail objective
NERR	National Electricity Retail Rules

NMI	National Metering Identifier
NPV	net present value
PV	photovoltaic
SRES	Small-scale Renewable Energy Scheme

A Summary of related projects

A.1 Connecting embedded generators[103]

On 17 April 2014, the Commission made a rule establishing a framework that provides for the efficient connection of registered embedded generators (that are larger than the AEMO exemption from registration threshold of 5 MW)[104] to distribution networks.

The rule established a new framework for the purpose of reducing the barriers that embedded generation proponents who are registered to participate in the market, have faced in attempting to connect to distribution networks. It also accommodates the need for distributors to adapt their networks to the changing environment while maintaining the reliable and safe supply of electricity to all consumers.

One of the key features of the final rule was to require distributors to publish a register of generating plants that have been successfully connected to the network in the preceding five years, in order to allow embedded generators to better understand the types of equipment that have been able to connect to a distribution network.

In November 2014, the Commission made a rule that also allowed non-registered embedded generators (i.e. generators with a capacity less than 5 MW but who are not micro embedded generators) to use this framework if they elect to do so. The rule also requires all completed embedded generator projects under Chapter 5A of the National Electricity Rules (NER) (other than micro embedded generators) to be included in a public register.[105]

A.2 Improving demand side participation information[106]

On 26 March 2015, the Commission made a rule that provides a process by which AEMO may obtain information on demand side participation (DSP) from electricity registered participants for the purposes of informing its load forecasts under the NER.

The final rule requires:

- registered participants to provide to AEMO information on demand side participation, in accordance with new DSP information guidelines

103 AEMC, *National Electricity Amendment (Connecting Embedded Generators) Rule 2014,* final determination, 17 April 2014.

104 That is, registered embedded generators, generators intending to apply for exemption from registration, and generators in Victoria and Queensland that are able to access the Chapter 5 process.

105 AEMC, *National Electricity Amendment (Connecting Embedded Generators under Chapter 5A) Rule 2014*, final determination, 13 November 2014.

106 AEMC, *Improving demand side participation information*, final determination, 26 March 2015, pp. i-ii.

- AEMO to develop these guidelines in consultation with registered participants and other interested stakeholders, providing these parties with an opportunity to engage with AEMO on the appropriate specification of the guidelines
- AEMO to have regard to registered participants' costs of efficient compliance with the guidelines compared to the likely benefits of the use of that information by AEMO for the purpose of its load forecasts under the NER
- AEMO to take the information on demand side participation received into account when developing and using load forecasts under the NER
- AEMO to publish details, no less than annually, on the extent to which demand side participation information has informed the development or use of its load forecasts.

The final rule also articulates the scope of information that AEMO may specify be required to be provided under the guidelines.

A.3 Integration of storage[107]

On 3 December 2015 the AEMC published its final report on the integration of energy storage. This report recommended that the Australian Energy Regulator (AER), as part of its ongoing compliance work in this area, review existing DNSP basic connection services offerings for micro-embedded generation[108] to ensure they clearly articulate their applicability to the connection of a storage system intending to export electricity to the grid.[109]

A.4 Distribution market model project

As part of its new technologies work program, the Commission completed a project to examine how a market for electricity services at the distribution level might develop. The project considered how current arrangements might incentivise or disincentivise the emergence of different business models. On the back of this, it considered whether the regulatory framework and distribution market design needs to change to accommodate this potential evolution.

On 22 August 2017, the AEMC published the final report on this project. The report sets out the key characteristics of a potential future that enables investment in and operation of distributed energy resources to be optimised to the greatest extent

107 See the project page on the AEMC website: https://www.aemc.gov.au/our-work/technology-work-programme

108 The report notes that a retail customer seeking to connect storage capability at their premises to the distribution system with the intention of exporting electricity to the grid – whether in conjunction with a solar photovoltaic (PV) system, for example, or a standalone device – would be captured by the existing definition of 'micro-embedded generator', as long as the connection is of the kind contemplated by Australian Standard 4777 (Grid connection of energy systems via inverters).

109 AEMC, *Integration of Energy Storage, Regulatory Implications*, final report, 3 December 2015, p.vi.

possible, as well as a number of findings representing short-term actions that need to be undertaken in order to facilitate distribution-level markets.

One of these findings was a request for AEMO to continue to identify any information gaps related to distributed energy resources for the purposes of maintaining power system security. The Commission noted that AEMO, as the party responsible for maintaining overall power system security, is likely to need more information about power flows on distribution networks as the uptake of DER increases.

A.5 Reliability frameworks review[110]

The Commission is currently reviewing the current market and regulatory frameworks that support the reliability of the electricity system in light of the transformation the energy sector is facing. This review will provide a holistic look at the reliability framework, with a view to proposing a coherent package for the future. This review also includes consideration of several recommendations from the *Independent Review into the Future Security of the National Electricity Market (Finkel Panel review)* that relate to reliability.

On 19 December 2017, the AEMC published an interim report for this review that provided an update on the Commission's analysis and views to date on a number of matters. Of particular relevance to this rule change, the Commission set out its preliminary views in relation to forecasts and information provision to the market, which are the foundation of the reliability framework. The Commission agreed with AEMO that as the electricity system evolves it is likely that there could be increased errors in forecasting making it harder to for participants to participate in, and for the system operator to operate, the wholesale market. For example, an increasing penetration of distributed energy resources, combined with a more responsive demand-side, will make it harder to forecast demand, particularly at a more granular level. More generally, increased variances in forecasting may result in increased risks for participants (e.g. knowing when to be available or to rebid), as well as making it more difficult for AEMO to manage reserves on tight demand-supply days.

A directions paper on this review will be published in late March 2018.

110 See the project page on the AEMC website: http://www.aemc.gov.au/Markets-Reviews-Advice/Reliability-Frameworks-Review

B Current sources of information and their limitations

The COAG Energy Council indicated that even though there are currently mechanisms that collect some information on behind the meter DER, there are gaps in those mechanisms. This section provides a summary of the existing mechanisms in place that collect data related to small-scale behind the meter DER, the data collection process, the compliance requirements and challenges and also the limitations of each mechanism:

- Small-scale renewable energy scheme
- DNSPs' connection application process
- AEMO's demand side participation guidelines

B.1 Small-scale Renewable Energy Scheme (Clean Energy Regulator)

Under the Small-scale Renewable Energy Scheme (SRES), eligible small-scale renewable energy systems (including solar PV panels, wind turbines and hydro systems) may be entitled to small-scale technology certificates, which can be sold to recoup a portion of the cost of purchasing and installing the system.[111] Battery storage systems and components are not eligible to participate in the scheme, however, approved systems with an integrated battery could be.[112]

Data collection

The CER has frameworks in place to collect data on eligible small-scale renewable energy systems and it is mandatory for consumers to register their systems with the CER in order to receive incentives under the SRES. Box B.1 below summarises the CER process for collecting data on solar PV systems currently in place.

Box B.1 Requirements for small-scale renewable systems and data collection

Eligibility for small-scale certificates

To be eligible for small-scale technology certificates, small generation units must:

- be installed no more than 12 months prior to the creation of certificates, and have its panels and inverter listed on the Clean Energy Council list of

111 Clean Energy Regulator, viewed 9 February 2018, http://www.cleanenergyregulator.gov.au/RET/Scheme-participants-and-industry/Agents-and-installers/Small-scale-systems-eligible-for-certificates

112 Clean Energy Regulator, viewed 9 February 2018, http://www.cleanenergyregulator.gov.au/RET/Pages/How%20to%20participate%20in%20the%20Renewable%20Energy%20Target/Choosing%20a%20system/Battery-storage-and-eligibility-under-the-Small-scale-Renewable-Energy-Scheme.aspx

approved components

- meet Australian and New Zealand standards
- use a Clean Energy Council accredited designer and installer and meet the Clean Energy Council design and install guidelines
- comply with all local, state, territory and federal requirements, including electrical safety, and
- be classified as small-scale, and a solar panel system that has a capacity of no more than 100kW, and a total annual electricity output less than 250MW.

Documents for small-scale generation units

Documents required for small generation units include:

- a written compliance statement to confirm the system meets all relevant Australian and New Zealand standards, and all local, state or territory requirements
- a written compliance statement to confirm the installer has at least AUD$5 million public liability insurance, and complies with the Clean Energy Council code of conduct for system installations
- a "small-scale technology certificate assignment form" where the owner of the system has assigned their right to create the certificates, and
- all state or territory government electrical installation compliance documentation such as a certificate of electrical safety.

Under the Small-scale Renewable Energy Scheme, all signed compliance statements, forms, certificates, reports, photos and invoices must be retained for a minimum period of five years after certificates are created. The Clean Energy Regulator may request these documents at any time to prove that the system was eligible for small-scale technology certificates.

Source: Clean Energy Regulator website, viewed 1 February 2018.

Every month the Clean Energy Regulator publishes small-scale renewable energy installation data on its website. This data includes a list of small generation units and kilowatt (kW) capacity by installed postcode. The data represents all systems, including solar PV, that have had certificates validly created against them. The data includes new installations, upgrades to existing systems and stand-alone (off-grid) systems.

The Clean Energy Regulator already collects some information about battery storage systems included in the installation of small-scale generation units, where this information is provided voluntarily. When applying for creation of small-scale

generation certificates (STCs), registered agents can select the 'Connected to an electricity grid with battery storage' option and provide additional details.

The CER has also recently announced that they will start to collect additional information as an interim measure[113] ahead of the possible implementation of a national DER register.

Compliance

Under the Renewable Energy Target scheme participants must comply with the requirements of the *Renewable Energy (Electricity) Act 2000* and the *Renewable Energy (Electricity) Regulations 2001*.

The Clean Energy Regulator has the right to impose penalties on individuals who provide false or misleading information which results in the improper creation of small-scale technology certificates.[114]

The CER also conducts annual audits for the previous reporting year to educate scheme participants and confirm their compliance with the legislation. Some audits are also conducted where there is evidence of non-compliance.

Limitations

AEMO has stated that[115], even though it currently has mechanisms in place to receive the information about behind the meter installations of rooftop solar PV from the CER database, the data collected by the CER is limited in that:

- it represents installations registering for SRES only, where only systems less than 100 kW are required to register
- data may not be collected or maintained once the SRES scheme ends in 2030
- the deeming period for STCs decreases each year meaning there will be less financial incentives to register under the scheme closer to 2030, which means that many new installations may not be captured.

Another limitation of the CER database is that systems can be registered up to 12 months after installation, meaning that there can be a time lag in the information contained in the database.

113 Clean Energy Regulator, viewed 2 February 2018, http://www.cleanenergyregulator.gov.au/RET/Pages/How%20to%20participate%20in%20the%20Renewable%20Energy%20Target/Choosing%20a%20system/Battery-storage-and-eligibility-under-the-Small-scale-Renewable-Energy-Scheme.aspx

114 Clean Energy Regulator, viewed 9 February 2018, http://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/Administration/Scheme-compliance

115 AEMO, *Visibility of Distributed Energy Resources*, January 2017, p. 21.

B.2 DNSPs' connection application process

Under the NER, information about some distributed energy resources, including storage and solar PV systems that are connected to the distribution network by retail customers, will be captured by DNSPs when processing a connection application or amending an existing connection agreement.[116]

Box B.2 below explains, in general terms, the Connection Application Process applied by DNSPs.

Box B.2 Technical requirements and processes for connection

To interact with the network, such as through charging or consumption, a distributed energy resource must be connected to the electricity network. To do so, the person who owns the distributed energy resource must enter into a connection agreement with the local DNSP.

The connection arrangements set out in the NER establish the obligations and processes by which generating systems and loads connect to a transmission or distribution network. The regulatory framework for small loads and generating systems connecting to a distribution network is set out in Chapter 5A of the NER. These rules apply (among others) to:

- retail customers
- micro embedded generators (e.g. retail customers with solar PV or battery storage systems)
- non-registered embedded generators (connecting a system of less than 5 MW but larger than a micro embedded generator).

Technical requirements for connection

DNSPs need to apply some minimum requirements to the connection of distributed energy resources to make sure that those resources can technically and safely interface with the rest of the network.

The technical requirements in Chapter 5A of the NER for the connection of retail customers are much less prescriptive than those for registered participants that connect under Chapter 5 of the NER.

Chapter 5A contains requirements that the terms and conditions of model

116 In the Commission's 2015 Integration of Storage report, we concluded that a retail customer seeking to connect storage capability at their premises to the distribution system with the intention of exporting electricity to the grid – whether in conjunction with a solar PV system or as a standalone device – would be captured by the existing definition of 'micro-embedded generator' in the NER, as long as the connection is of the kind contemplated by Australian Standard 4777 (Grid connection of energy systems via inverters). See AEMC, *Integration of Storage*, final report, December 2015, p. 74.

standing offers or negotiations for connection services must cover "the safety and technical requirements (including jurisdictional or other legislation under which the requirements are imposed) to be complied with by the retail customer".[117] However, these requirements are not specifically set out in the NER.

Process for connection

Before commencing the installation of solar PV panels and batteries at a business or residence, the consumer must gain permission from their local DNSP to connect to the network by making a Network Connection Application.

Applicants can allow their solar or battery retailer or installer or any other third party to lodge the Network Connection Application and agree to the terms and conditions of the connection on their behalf. Alternatively, for some DNSPs applicants can lodge a Network Connection Application directly through the DNSP's website. Once submitted, the DNSP will conduct a network technical assessment to determine the impact of the solar power installation on the network, and the size of the system the applicant may connect.

Source: AEMC, *Distribution Market Model*, final report, August 2017, pp. 63-64.

Consumers may also wish to modify an existing connection to include distributed energy resources e.g. to install solar panels, or retrofit an existing solar PV system with storage capability.

Under the NERR, small customers are required to inform the DNSP of any proposed change that they are aware of in plant or equipment, including metering equipment, or any change to the capacity or operation of connected plant or equipment that may affect the quality, reliability, safety or metering of the supply of energy to the premises or the premises of any other person. Small customers are also required to inform either the retailer or the DNSP of any permanent material change to the energy load or pattern of usage at the premises.[118]

Data collection

DNSPs' existing Connection Application process requires consumers (or their agents) to provide certain information about proposed embedded generation, including type, size, make and model. In theory, static information about the location and technical characteristics of distributed energy resources should therefore already be captured by DNSPs when they process a new connection.

117 See: 5A.B.2(b)(4) of the NER.

118 See schedule 2, clause 6.2 (c) and (d) of the NERR.

Compliance

Some DNSPs have raised concerns that consumers (or their agents) do not always inform them of new connections or modifications to existing connections.[119]

The 2017 Jacobs' report found that, on average, only 30% of battery systems are being detected through the existing connection process. Jacobs carried out a survey with DNSPs, which indicated that this value can range from 5% to 50% depending on the DNSP and within the network of individual DNSPs.[120] The report stated that information about these installations might not be collected because of:

- installations of batteries pairing with existing solar PV systems where no new inverter or meter is needed
- installations of batteries in instances where electricians don't view these as a form of generation
- installations undertaken by non-electricians (<2.5kW).[121]

Ausgrid also noted that in some instances, installation of energy storage systems do not require a new or upgraded inverter to be installed, and may only require wiring from a battery to a previously installed and approved, "battery ready" inverter system (installed with a solar system). These systems may only require retrofitting a 48 volt DC battery system, which is electrical work not currently required to be done by a certified electrician in NSW. In these situations, compliance with reporting obligations for installation of energy storage systems may become more difficult.[122]

Limitations

While DNSPs currently collect some data on behind the meter DER via connection agreements, there is currently no obligation under the NER for DNSPs to collect and share specific technical data about DER systems with AEMO for the purposes of system security. Some of the mechanisms for data collection available to AEMO allow access to information the DNSPs have[123], but do not provide a right or obligation for DNSPs to collect specific new data as the technology within their networks changes.[124]

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119 In some instances this is because consumers may not have an incentive to do so, e.g. if notifying the DNSP would require them to upgrade equipment.

120 Jacobs, *Cost benefit analysis of options to collect and share information about small-scale battery storage*, final CBA report, June 2017, p. 20.

121 For example, according to the Jacobs' report, South Australia advised that the *Plumbers, Gasfitters and Electricians Act 1995 (SA)* contains a definition of 'electrical installation' that may allow non-licensed electricians to install batteries.

122 Ausgrid, submission to COAG Energy Council consultation paper on Energy Storage Registration, September 2016, p. 4.

123 These include: a) AEMO surveys DNSPs to inform long-term forecasts and details at each transmission connection point; b) general information gathering powers can be used if necessary for certain AEMO planning obligations.

124 AEMO, *Visibility of Distributed Energy Resources*, January 2017, p. 21.

AEMO has also noted that it has sought data on rooftop PV and energy storage in the past from DNSPs, with varying levels of success.[125]

In addition, currently any data collected by DNSPs is based on the DNSP needs at the distribution level, not the needs at the transmission level. DNSPs vary as to the level and type of data collected on DER, and how it is stored and used, creating inconsistencies across the NEM.[126]

Some DNSPs have a threshold under which systems are automatically pre-approved for connection to the network. Therefore, many small distributed energy resources (<5 kW) are connected without detailed analysis of the incremental impact they have on the network. The threshold differs between DNSPs and depends on the type of line a customer is connected to.[127]

Furthermore, a lack of consistent technical requirements across and within network areas, or a lack of transparency regarding the reasons why different technical requirements are being imposed, can increase the transaction costs of connecting distributed energy resources.[128]

B.3 AEMO's demand side participation guidelines

Clause 3.7D(e) of the NER, which was made following the *Improving demand side participation information provided to AEMO by registered participants* rule 2015[129] requires:

- AEMO to develop, maintain, and publish guidelines that require registered participants to provide demand side participation information to AEMO
- AEMO to take this information into consideration when developing its electricity load forecasts in accordance with the NER.

The Guidelines[130] specify the information that registered participants[131] must submit to AEMO for AEMO's use when developing or using electricity load forecasts, with the objective of giving AEMO better quality information to further develop and improve its current load forecasting.

125 AEMO, *Visibility of Distributed Energy Resources*, January 2017, p. 21.

126 Rule change request, p. 5.

127 AEMC, *Distribution Market Model*, final report, August 2017, p. 45.

128 AEMC, *Distribution Market Model*, final report, August 2017, p. 67.

129 AEMC, *Improving demand side participation information provided to AEMO by registered participants*, final determination, March 2015.

130 AEMO, *Demand side participation guidelines*, April 2017.

131 These Guidelines only applies to *registered participants* that have a contractual arrangement under which a person and the *registered participant* agree to the curtailment of *non-scheduled load* or the provision of unscheduled generation in certain specified circumstances.

Data collection

The Guidelines require registered participants to submit their DSP data annually, with the first submission scheduled to occur in April 2018.

Submission of DSP information will occur via a web portal where registered participants can securely submit their data. Options will be provided to allow for either manual entry of data or partly automated submission using Comma Separated Values (CSV) files.

The information required to be provided by each registered participant is at the NMI level. This is to enable AEMO to reconcile the DSP information provided in accordance with the guidelines with other data sources, such as metering and pricing databases, to assess the accuracy of the data provided.

Compliance

The obligation imposed on registered participants by the Guidelines is to provide data that is obtainable under their current business processes.

Clause 3.7D(b) of the NER requires all registered participants to provide DSP information to AEMO in accordance with the guidelines.

AEMO requires registered participants to complete a data request in a pre-defined standard form, and provide all requested data that is available through their current DSP information collection processes.

Although AEMO does not require registered participants to enhance their DSP information collection processes for the purpose of complying with the guidelines, if any registered participant does so, AEMO expects to receive data obtained by that registered participant following the introduction of the enhanced DSP information collection process.

Limitations

As the DSP guidelines only apply to registered participants, not all DER installed behind the meter will be captured by AEMO. Some of these DER may be reported by a registered participant if they participate in service provision[132], most likely through a retailer or third-party aggregator, in which case AEMO will have visibility through these registered entities. However, a large subset of DER installed behind the meter is expected to be operated solely by consumers, who are not NEM registered participants.

AEMO indicated that a further restriction of this information mechanism is that it only allows AEMO to access information for load forecasting purposes. There is no ability to

132 For example, demand response programs, which involve paying an incentive for energy users to reduce their power consumption, switch to backup generation or dispatch their energy storage for short periods when electricity reserves reach critically low levels.

collect information for understanding the load response to system disturbances, or power system security studies more generally.[133]

133 AEMO, *Visibility of distributed energy resources*, January 2017, p. 22.

C Overview of the current electrical safety framework[134]

The electrical system is designed with extensive safety systems to provide for the protection of the system itself, workers and the public. Each NEM region is subject to different safety requirements as set out in the relevant jurisdictional legislation. State and territory legislation governs the safe supply of electricity by network service providers and the broader safety requirements associated with electricity use in households and businesses.

C.1 Queensland

In Queensland, the Electrical Safety Office is the electrical safety regulator that undertakes a range of activities to support electrical safety with the key objective of reducing the rate of electrical fatalities in Queensland. The *Electrical Safety Act 2002 (Qld)* places obligations on people who may affect the electrical safety of others. This stand-alone legislation fundamentally changed Queensland's approach to electrical safety, establishing a Commissioner for Electrical Safety, an Electrical Safety Board and three Board committees to advise the Minister on electrical safety issues. Additionally, an independent state-wide electrical safety inspectorate was established to administer and enforce the new legislative requirements.

One of the responsibilities of the Electrical Safety Board is the development of a five year strategic plan for improving electrical safety in Queensland. The Electrical Safety Plan for Queensland 2014–2019 was published in 2013 and sets out strategies designed to achieve the Board's goal of eliminating all preventable electrical deaths in Queensland by 2019.

C.2 NSW

In NSW, IPART is the safety and reliability regulator for electricity networks under the *Electricity Supply Act 1995 (NSW)* and the *Electricity Supply (Safety and Network Management) Regulation 2014 (NSW)*. IPART strives to ensure safe and reliable supply of electricity for the benefit of the NSW community (including employees of the network operators) and the environment. IPART has been granted new compliance and enforcement powers with an overall objective to:

- maintain safety standards within electricity networks
- meet relevant reliability standards set by government.

Electricity networks continue to have the ultimate responsibility for network safety and reliability. IPART holds these utilities accountable by developing an effective risk based compliance and enforcement framework.

134 Reliability Panel, *Annual market performance review 2016*, Final report, 16 May 2017, Appendix H.

The NSW Fair Trading monitors the safety of customer electrical installations under the *Electricity (Consumer Safety) Act 2004 (NSW)* and *Electricity (Consumer Safety) Regulation 2015 (NSW)*. SafeWork NSW monitors the safety of work places under the *Work Health and Safety Act 2011 (NSW)* and *Work Health and Safety Regulation 2011 (NSW)*. The NSW Department of Industry authorises accredited service providers under the *Electricity Supply Act 1995 (NSW)* and the *Electricity Supply (General) Regulation 2014 (NSW)*.

C.3 ACT

The ACT Planning and Land Authority administers the *Electricity Safety Act 1971 (ACT)* and *Electricity Safety Regulation 1971 (ACT)* in the ACT. This legislation ensures electrical safety, particularly in relation to:

- the installation, testing, reporting and rectification of electrical wiring work for an electrical installation and its connection to the electricity distribution network (the Wiring Rules are the relevant standard)
- the regulation and dealings associated with the sale of prescribed and non-prescribed articles of electrical equipment
- the reporting, investigation and recording of serious electrical accidents by responsible entities
- enforcement by Access Canberra and its electrical inspectors (including inspectors' identification, entry powers, seizing evidence, disconnection of unsafe installations and articles, powers to collect verbal and physical evidence and respondents' rights)
- the appeals system
- miscellaneous matters such as certification of evidence.

C.4 Victoria

Electricity safety in Victoria is regulated by Energy Safe Victoria. The role of Energy Safe Victoria involves overseeing the design, construction and maintenance of electricity networks across the state and ensuring every electrical appliance in Victoria meets safety and energy efficiency standards before it is sold. Energy Safe Victoria oversees a statutory regime that requires major electricity companies to submit and comply with their Electricity Safety Management Scheme, submit bush fire mitigation plans annually for acceptance and electric line clearance management plans annually for approval, and to actively participate in Energy Safe Victoria audits to test compliance of their safety systems.

C.5 South Australia

In South Australia, the Office of the Technical Regulator is responsible for the administration of the *Electricity Act 1996 (SA)* and *Energy Products (Safety and Efficiency) Act 2000 (SA)*. The primary objective of these Acts is to ensure the safety of workers, consumers and property as well as compliance with legislation, technical standards and codes in the electricity industries.

The principal functions of the Office of the Technical Regulator under the *Electricity Act 1996 (SA)* are:

- monitoring and regulation of safety and technical standards in the electricity supply industry
- monitoring and regulation of safety and technical standards relating to electrical installations
- administration of the provisions of the Act relating to clearance of vegetation from power lines
- fulfilling any other function assigned to the Technical Regulator under the Act.

C.6 Tasmania

Until 1 June 2010, several safety functions were vested with the Office of the Tasmanian Economic Regulator under the *Electricity Industry Safety and Administration Act 1997 (Tas)* and the *Electricity Supply Industry Act 1995 (Tas)*. The Electricity Industry Safety and Administration Act 1997 (Tas):

- provides for electrical contractors and workers to be appropriately qualified and regulated
- establishes safety standards for electrical equipment and appliances
- establishes safety standards for electrical equipment and appliances.

Safety-related responsibilities were transferred to Workplace Standards Tasmania via an amendment to the *Electricity Industry Safety and Administration Act 1997 (Tas)* in 2009.