DISTRIBUTED ENERGY RESOURCES REGISTER INFORMATION GUIDELINES

DRAFT REPORT AND DETERMINATION

Published: **April 2019**

Australian Energy Market Operator Ltd ABN 94 072 010 327 www.aemo.com.au info@aemo.com.au

NEW SOUTH WALES QUEENSLAND SOUTH AUSTRALIA VICTORIA AUSTRALIAN CAPITAL TERRITORY TASMANIA WESTERN AUSTRALIA

NOTICE OF SECOND STAGE CONSULTATION – DISTRIBUTED ENERGY RESOURCES REGISTER INFORMATION GUIDELINES - 2019

National Electricity Rules – Rule 8.9

Date of Notice: Friday, 5 April 2019

This notice informs all Registered Participants and interested parties (Consulted Persons) that AEMO is commencing the second stage of its consultation on the development of Distributed Energy Resources Information Guidelines.

This consultation is being conducted under clause 3.7E of the National Electricity Rules (NER), in accordance with the Rules consultation requirements detailed in rule 8.9 of the NER.

Invitation to make Submissions

AEMO invites written submissions on this Draft Report and Determination (Draft Report).

Please identify any parts of your submission that you wish to remain confidential, and explain why. AEMO may still publish that information if it does not consider it to be confidential, but will consult with you before doing so.

Consulted Persons should note that material identified as confidential may be given less weight in the decision-making process than material that is published.

Closing Date and Time

Submissions in response to this Notice of Second Stage of Rules Consultation should be sent by email to DERRegister@aemo.com.au, to reach AEMO by 5.00pm (Melbourne time) on Wednesday, 24 April 2019.

All submissions must be forwarded in electronic format (both pdf and Word). Please send any queries about this consultation to the same email address.

Submissions received after the closing date and time will not be valid, and AEMO is not obliged to consider them. Any late submissions should explain the reason for lateness and the detriment to you if AEMO does not consider your submission.

Publication

All submissions will be published on AEMO's website, other than confidential content.

EXECUTIVE SUMMARY

The publication of this Draft Report and Determination (Draft Report) commences the second stage of the Rules consultation process conducted by AEMO to develop Distributed Energy Resources Information Guidelines (Guidelines) under the National Electricity Rules (NER).

The Guidelines will specify the information that Network Service Providers (NSPs) must submit to AEMO. The information submitted will be used to give NSPs and AEMO visibility of where DER are connected to support more efficient planning and operation of the power system.

AEMO published an issues paper in January 2019, in which it proposed that the guidelines:

- Facilitate the ongoing collection and maintenance of DER generation information.
- Provide for the storage of DER Register generation information in new MSATS tables and facilitate submission and access through existing means and new APIs.
- Specify the publication of a monthly DER Register report to be aggregated by postcode.
- Focus on obtaining details of DER Generation information at the aggregate installation level and equipment level (i.e. AC connection and device).

AEMO has prepared this Draft Report to provide stakeholders with a view of how we have considered key issues raised by stakeholders, including:

- The framework and actors for the collection of DER Register information.
- Use of default data and auto-population to reduce the burden of collecting information.
- The format of submission and access to the DER Register.
- The use of Demand Side Participation Information in the DER Register.
- How DER Register information will be provided to Emergency Services Agencies.
- The data AEMO will publish.
- The content and extent of DER Register data.

After considering these issues and all submissions received, the key points in AEMOs draft decision are:

- The information collection framework should be designed to support the variability in distribution network service provider (DNSP) processes and include the capability to capture the 'as-installed' system details where these can be provided by those responsible for the installation of DER.
- AEMO will support the use of default values and auto-population in the DER Register to promote efficiency and reduce data entry burden on collection actors. AEMO will support DNSPs to provide default information in their desired format and utilise existing product databases where these are available.
- The Guidelines will require NSPs to submit DER generation information on an ongoing basis, with information to be submitted no later than *20 business days* following the date of installation, change or decommission.
- NSP submission and access to the DER Register will be facilitated through API and Web interface methods.
- DER generation information will be decoupled from MSATS and stored in an AEMO managed Database with data encrypted at rest and access protected with appropriate authentication and authorisation. The DER Register information is intended to be identified by NMI and is tightly coupled to NMI standing data.
- The scope of the data content specified by the Guidelines has been refined.
- The format, content and timing of the DER Register report is largely consistent with the proposal in AEMO's Issues Paper published in January 2019.

AEMO's draft determination is to make the Distributed Energy Resources Information Guidelines in the form published alongside this Draft Report. AEMO welcomes further stakeholder feedback on the Draft Information Guidelines and the draft decisions noted in this report.

CONTENTS

1. STAKEHOLDER CONSULTATION PROCESS

As required by clause 3.7E (h)(3) of the National Electricity Rules (NER), AEMO is consulting on the development of Distributed Energy Resource Information Guidelines (DER Guidelines) in accordance with the NER consultation process in rule 8.9.

AEMO's indicative timeline for this consultation is outlined below. Future dates may be adjusted depending on the number and complexity of issues raised in submissions.

Deliverable	Indicative date
Notice of first stage consultation [and Issues Paper] published	29 January 2019
First stage submissions closed	7 March 2019
Draft Report & Notice of second stage consultation published	5 April 2019
Submissions due on Draft Report	24 April 2019
Final Report published	31 May 2019

The publication of this Draft Report marks the commencement of the second stage of consultation.

Note that there is a glossary of terms used in this Draft Report at Appendix A.

2. BACKGROUND

2.1. NER requirements

Under Rule 7E of the NER, AEMO is required to develop, maintain and publish guidelines that require Network Service Providers (NSPs) to provide DER generation information to AEMO, including:

- The information required to be provided by NSPs.
- The type of Demand Side Participation (DSP) information, submitted to AEMO under 3.7D(b), that will be included in the register.
- When the information must be provided and updated by NSPs.
- How the information must be provided by NSPs.
- How the information in the DER register is stored.
- The manner and form in which AEMO will publish details on the extent that the information received has informed AEMO's development or use of *load* forecasts (ie, in accordance with clause 3.7E(f)).
- How AEMO will provide access to NSPs.
- The contents, form, timing and method of aggregation of the DER register report, to be published in accordance with clause 3.7E(l).
- AEMO's approach to the protection of any confidential information and personal information in the DER register.

AEMO is required to develop and publish the *DER register information guidelines* by 1 June 2019, with a minimum of three months before they come into effect.

2.2. Context for this consultation

On 13 September 2018, the AEMC finalised NER 3.7E for AEMO to establish a register of DER in the NEM, including small scale battery storage systems and rooftop solar.

The aim of the register is to give network businesses and AEMO visibility of where DER are connected to help in planning and operating the power system.

The new register must be in place by 1 December 2019. The transitional rule provisions commenced on 18 September 2018, include an obligation on AEMO to make and publish the first DER Register information guidelines by 1 June 2019.

2.3. First stage consultation

AEMO issued a Notice of First Stage Consultation on 29 January 2019. AEMO developed and published an issues paper, which outlined the questions and issues central to the development of the DER Guidelines.

AEMO received 15 written submissions in the first stage of consultation and has held the following meetings and forums where several of the material issues were also raised. AEMO thanks stakeholders for their contributions to the development of the DER Register. In particular, the support from the Clean Energy Regulatory, distribution network service providers (DNSPs) and the Clean Energy Council has significantly contributed to date.

Meeting Name	Attendees	Date
DER Register meeting on collection	AusGrid, Ausnet Services, CitiPower Powercor, Clean Energy Council, Clean Energy Regulator, Deakin University, Endeavour Energy, Energy Queensland, Essential Energy, EvoEnergy, Ernst Young, FormBay, Jemena, Kickstart Agile, SA Power Networks, Smart Energy Council, Solar Scope, TasNetworks, United Energy	Friday, 1 February 2019
Meeting with Clean Energy Council members	Clean Energy Council, SMA-Australia, Greensync, ZN Shine Solar, Clean Energy Regulator, Western Power, AGL, Tesla, ABB, Greenbank Environmental, Solar Analytics	Thursday, 28 February 2019
Delivery team 2 (process design) meeting	AusGrid, AusNet Services, CitiPower Powercor, Clean Energy Council, Endeavour Energy FormBay, Jemena, Solar Scope, TasNetworks, United Energy	Friday, 15 March 2018
Delivery team 1 (data model) meeting	Ausgrid, AusNet Services, Citipower Powercor, Endeavour Energy, Energy Queensland, Jemena, Solar Scope, TasNetworks, United Energy	Wednesday, 20 March 2019

Copies of all written submissions, minutes of meetings and issues raised in forums (excluding any confidential information) have been published on AEMO's website at: https://www.aemo.com.au/Stakeholder-Consultation/Consultations/NEM-Distributed-Energy-Resources-Information-Guidelines-Consultation?Convenor=AEMO%20NEM.

3. SUMMARY OF MATERIAL ISSUES

The material issues arising from the proposal and raised by Consulted Persons in formal written submissions are summarised in the following table:

	Ausgrid	AusNet Services	CitiPower Powercor	Clean Energy Council	Endeavour Energy	Energy Australia	Energy Queensland	FormBay	GreenSync	Origin Energy	Red and Lumo Energy	SA Power Networks	Tesla	United Energy	Redback Technologies	University of Sydney
1. Collection framework	X	X	X	X	X		X	X				X	X	X	X	
2. Collection actors	X	X	X	X	X				X		X		X	X	X	
3. Use of default values and auto-population	X	X	X	X	X		X	X				X	X	X	X	
4. Submission frequency					X							X				
5. Submission format and storage	X		X			X	X	X			X	X		X		
6. Integration of DSP and DER generation information	X	X	X		X		X	X			X		X	X		
7. Data access	X	X	X		X	X		X		X	X	X		X		
8. Emergency Services access																X
9. Data content	X	X	X		X		X	X				X	X	X		
10. DER Register report	X	X	X		X	X	X	X				X	X	X		
11. Privacy		X							X							

AEMO notes that further views have been received via email from some stakeholders. A detailed summary of the issues raised together with AEMO's responses, is contained in Appendix B.

4. DISCUSSION OF MATERIAL ISSUES

The following sections summarise the material issues raised by stakeholders along with AEMO's assessment of the issues and final response.

4.1. Collection framework

4.1.1. Issue summary and submissions

AEMO has received a range of feedback about the DER Register information collection process from various stakeholders. This feedback generally supported the need for a collection framework that balances process efficiency with the provision of accurate information.

The Issues Paper provided a very high-level functional summary of the proposed process, along with the associated principles for the collection process[1]. AEMO agrees with Tesla[2] that this level of detail in the Issues Paper was insufficient for stakeholders to garner a clear view of the proposed collection process.

[1] AEMO, DER Register Information Guidelines, Issues Paper, 29 January 2019, pp. 6-7.
[2] Tesla submission to first stage consultation.

AEMO has since invested more effort in the collection framework design, including meetings with stakeholders and initiation of the stakeholder working group which focusses on the collection framework (Delivery Team 2). Related documents are available on the AEMO website[3].

Submissions received, and subsequent discussions have reflected the level of detail provided in the Issues Paper. For example, DNSPs provided various views on the collection process and tend to prefer a process that supports the efficiency of existing DER connection processes and the ability for DNSPs to meet regulatory obligations. These views have subsequently informed the drafting of a collection process design[4] which AEMO also made available to stakeholders.

DNSPs also raised concerns about process timing, and the risks of burden and inefficiency[5,6] and tying the DER Collection framework into existing jurisdictional requirements. For example, SA Power Networks (SAPN) indicated that the South Australian Office of the Technical Regulator (OTR)[7] collects detailed DER information that could support the DER Register and noted that there can be significant differences in timing for current information collection systems.

Some DNSPs[8] and the Clean Energy Council (CEC)[9] raised the opportunity to align the existing Clean Energy Regulator (CER) data collection process and the DER Register collection process. These submissions indicate that there is a risk of unnecessary burden on DER installers and DNSPs if duplicative processes are introduced by the DER Register.

The CEC[10] and Redback Technologies[11] went further and suggested that the establishment of the DER Register may be an opportunity to align all the various processes surrounding DER installation into the one process. This could be supported by existing and emerging resources, such as the product databases required by the CER and Energy Networks Australia's (ENA) work on nationally consistent DER connection guidelines.

Ausgrid noted that that the focus has largely been in smaller DER which complies with the Small Technology Certificate (STC) requirements for the CER, and that larger DER also needs to be accommodated in the DER Register[12].

4.1.2. AEMO's assessment

AEMO agrees that the collection framework would be more efficiently implemented and better support DNSPs in gathering information should it align to existing connection processes. However, consultation has revealed that DNSPs have varied levels of sophistication in their existing processes and systems, implying that a NEM-consistent DER Register will provide larger benefits to some DNSPs than others. AEMO has listened to this feedback and has sought to design a collection process that balances these trade-offs.

AEMO accepts there are material risks of process duplication should the DER Register and CER collection processes be significantly uncoordinated. The CER's role is to regulate the functions conferred to it through related Commonwealth legislation. The DER Register must be designed to conform to the NER

[3] Available at: https://www.aemo.com.au/Stakeholder-Consultation/Consultations/NEM-Distributed-Energy-Resources-Information-Guidelines-Consultation?Convenor=AEMO%20NEM.

[4] Available at: https://www.aemo.com.au/-/media/Files/Stakeholder_Consultation/Consultations/NEM-Consultations/2019/DER-register/Data-collection---high-level-process.pdf. Available at: https://www.aemo.com.au/-/media/Files/Stakeholder_Consultation/Consultations/NEM-Consultations/2019/DER-register/Data-collection---high-level-process.pdf

[5] Citipower Powercor and United Energy submissions to first stage consultation.

[6] Collection meeting minutes, 1 February 2019.

[7] SAPN submission to first stage consultation.

[8] AusGrid, EnergyQueensland submissions to first stage consultation.

[9] CEC submission to first stage consultation.

[10] CEC submission to first stage consultation.

[11] CECRedback Technologies submission to first stage consultation.

[12] Ausgrid submission to first stage consultation.

requirements, which endure regardless of other legislative arrangements. Building in a reliance on the CER's processes into the collection framework may impose unintended costs in the future should legislation that directs the CER change.

AEMO has consulted with the CER, ENA, DNSPs, and the CEC (which develops and maintains accredited product listings for the CER) in the development of the draft collection framework. AEMO agrees that an ideal process would integrate and unify all existing processes and draw on all existing resources, however this is not technically feasible within the development of the DER Register. For example, the CER's process to apply for rebates for STCs is a post-commissioning process that is not closely linked to the DER connection process and therefore cannot be altered directly by the implementation of the DER Register.

AEMO already uses the CER DER information to inform forecasting and operational decisions. The AEMC intended for the DER Register to "give networks and AEMO visibility of where DER is connected so they can plan and operate the power system more efficiently"[13]. Therefore, AEMO intends to use the DER Register to gather information at a granularity needed to support refined planning and operational decisions.

Despite the challenge of integrating all the existing processes AEMO intends to draw on them wherever possible to create efficiencies. The draft collection process proposes to draw on existing product databases and enable data entry systems to be designed by third parties, such as application developers, who are best placed to integrate information provision for both the DER Register and the CER. The aim of this draft collection process is to enable these service providers to deliver outcomes where users believe it adds value. FormBay, Solar Scope, and Kickstart Agile are a few such stakeholders already providing these services to DER Installers[14,15].

AEMO agrees with Ausgrid that the DER Register has focussed on smaller DER. This is consistent with the NER requirements for the DER Register. The collection framework and data model has been designed to accommodate all DER sizes and anticipated technologies and to permit DNSPs to define default input data associated with DER size categories and connection processes (where desired).

In developing the draft collection framework AEMO is seeking to deliver an efficient outcome that supports the NER-prescribed basic, standard and negotiated connection processes[16]. It supports DNSPs control of permission for parties such as DER Installers to access certain data associated with a DER installation[17], subject to appropriate protections of confidential information. It also create a single source for DNSPs to enter approved DER installation data and confirm the data that is submitted to the DER Register. AEMO is of the view that the draft Information Collection Framework would support DNSPs in their DER connection approval processes[18]. The draft collection framework aims to have a low immediate impact on existing processes while creating the opportunity for greater streamlining of processes going forward.

4.1.3. AEMO's conclusion

Appendix F provides an overview of the draft Information Collection Framework to provide stakeholders with an opportunity to comment.

AEMO has considered various stakeholder views in developing the draft framework. AEMO is of the view that the draft Collection Framework supports the DER Register principles as outlined in the Issues Paper, and the National Electricity Objective.

[13] AEMC, Register of distributed energy resources, Rule determination, 13 September 2018, p.i.
[14] FormBay submission to first stage consultation.
[15] Collection meeting minutes, 1 February 2019.
[16] NER Chapter 5A.
[17] SAPN and Endeavour Energy submissions to first stage consultation.
[18] Collection meeting minutes, 1 February 2019

AEMO welcomes stakeholder feedback on these matters and will continue to refine this with stakeholders through Delivery Team 2.

4.2. Collection actors

4.2.1. Issue summary and submissions

Stakeholders commented that the role of the various actors involved in the installation of DER was not clearly defined and articulated in the Issues Paper..

The DER Register rule provides that DNSPs are responsible for providing DER information to the DER Register[19]. Further, when preparing the Guideline, AEMO must have regard to the reasonable costs of efficient compliance by NSPs with the guidelines, compared to the likely benefits from the use of the DER information.[20]

Stakeholders have expressed a range of views around whether greater efficiencies are achieved through involving parties additional to the NSP in the collection process. Several DNSPs and Redback Technologies[21] expressed a view that the establishment of the DER Register would add value by creating the opportunity for DER installers to input and confirm some elements of the DER Register information at the time of installation[22]. Some DNSPs emphasised that the NSPs are required to enter data consistent with connection agreements and would manage exceptions where installer-entered data did not align with their expectations[23]. Citipower Powercor and United Energy provided a view that only specific parties should be permitted to enter data for the fields designated for their access and propose that AEMO should manage data discrepancies where they arise. They also sought clarification of where the data was coming from for data fields associated with installer input[24].

The CEC and Tesla disagreed with DER installers having a role in data entry citing excessive administrative burden for installers. They suggested that only NSPs need to submit the data[25]. Tesla provided a similar view noting that relying on installers increases the likelihood of inaccurate data[26], while GreenSync suggested the assumption that "installers are able to meet the requirements for data collection" should be validated[27]. Redback Technologies highlighted that manual rework or a lack of integration between AEMO and NSPs will impose costs on installers, impacting quality and completeness of the DER Register[28]. Red and Lumo Energy also supported this position while indicating that installers should provide information to support the connection application and offer, not information directly to the DER Register[29].

Some stakeholders provided a view that installers do not have any incentive to provide accurate DER information[30]. This could create challenges for the integrity of the DER Register, especially in cases where there is not already a technology-specific incentive such as for storage[31], or where a DER asset is changed

[19] Rule 3.7E(d).
[20] Rule 3.7E(h)(i),
[21] Redback Technologies submission to first stage consultation.
[22] CitiPower Powercor and United Energy, Endeavour Energy, EnergyQueensland and AusNet Services submissions to first stage consultation.
[23] Endeavour Energy, EnergyQueensland and AusNet Services submissions to first stage consultation.
[24] CitiPower Powercor and United Energy submissions to first stage consultation.
[25] CEC and Tesla submissions to first stage consultation.
[26] Tesla submission to first stage consultation.
[27] Greensync submission to first stage consultation.
[28] Redback Technologies submission to first stage consultation.
[29] Red and Lumo Energy submission to first stage consultation.
[30] CEC, Tesla, Endeavour Energy and Ausgrid submissions to first stage consultation.
[31] CEC submissions to first stage consultation.

or decommissioned[32]. Endeavour Energy noted that the Information Collection Guidelines must be very clear about the roles of the parties in data entry to ensure clear lines of accountability[33].

DER inverter Original Equipment Manufacturers (OEMs) acknowledged that the capability for remote reading and changes to inverter settings is already deployed for their inverters. SMA indicated this is an opportunity to gather inverter data remotely and at low costs[34]. This may not be the case for all OEMs, and AEMO seeks stakeholder input on the extent that this capability is available and emerging.

4.2.2. AEMO's assessment

In developing the DER Register Data Model and Information Collection Framework AEMO aims to meet the rules-defined accountability on DNSPs for the data in the DER Register while aligning the collection process as closely as possible to the NER connection application/agreement processes. Appropriate alignment with existing processes will support efficient compliance by DNSPs, reducing compliance costs. However, AEMO acknowledges that there may be discrepancies between the information agreed to by the DNSP and that installed on site. DER installers are accountable for ensuring their installation is compliant with connection offers provided by DNSPs.

AEMO's view is that the DER Register should enable DNSPs to enter data in relation to a particular DER installation and to manage the extent to which they allow installers to edit this data. This will be the most efficient approach to manage the variation in existing connection processes while gathering as-installed DER information. Further, this arrangement will maximise the value the DER Register can provide to DNSPs by reinforcing their ability to ensure DER installations are compliant with their associated connection agreements, and to AEMO's forecasting and operational decisions. At all times, the DNSP remains responsible for providing the information to the DER Register under the NER. AEMO's approach to data collection in the DER Register aims to assist the DNSPs in managing this responsibility in a cost-efficient manner.

AEMO acknowledges the concerns raised by installer representatives about the potential accuracy of the information submitted. The use of existing product databases and DNSPs-entered default information is intended to streamline the data entry process and increase the extent to which installers are confirming data, rather than entering new data. Further, AEMO is of the view that DER installers should have sufficient competency to provide this information. AEMO will develop and release training material to support installers and DNSPs. This material can be made available by DNSPs to installers and could be implemented within installer training programs.

DNSPs already require DER sales businesses and installers to provide them with sufficient technical information to support a connection agreement. The DER Register rule change included minor revisions to Chapter 5A rules to clarify that DNSPs may require relevant DER information for basic, standard and negotiated connections[35]. It is AEMO's view that implementing a collection framework that facilitates DER installers providing and confirming DER information directly into the DER Register will not in practice impose additional burdens on DER installers.

The Information Collection Framework will designate that DNSPs are accountable for data entry to the DER Register, and that installers can access the register to enter and validate DER information associated with the DER installation with the permission of the DNSP. DNSPs should also consider the need for changes to their model standing offers required to implement this framework.

AEMO's view is that the proposed approach:

[32] Tesla submission to first stage consultation.
[33] Endeavour Energy submission to first stage consultation.
[34] Minutes from CEC meeting, 28 February 2019.
[35] AEMC, 2018, National Electricity Amendment (register of distributed energy resources) Rule 2018 No. 99, refer 5.3.3, 5A.B.2, 5A.B.4, 5A.C.3

- Enables the DNSP to control access to the DER Register for installers (by associating National Metering Identifiers [NMIs] and connection application/offer identifying numbers ['job numbers'] for a DER installation).
- Creates a more flexible DER Register that accommodates data entry by the actors associated with large DER (e.g. designers, electrical contractors, registered practicing engineers), who do not have a requirement to registered with the CEC as an accredited DER installer.
- Does not rely on the DNSP having knowledge of the installer identification at the time of the connection offer (which may not be available). The DER Register creates the opportunity to capture identifying details of the installers and contractors associated with a DER installation at the time of installation. This is currently not collected by all DNSPs and capturing it in the DER Register increases the visibility for DNSPs to act on installations and installers where substandard information is provided (such actions may include making a complaint against the installer with the appropriate accreditation body).

AEMO is considering the case of remote reading and changes to inverter settings by OEMs and is asking for stakeholder views on how this can be managed to ensure DER information integrity is maintained. For example, should DNSPs ensure that retail customers are made aware of the procedures for reporting any material changes to a DER installation, and that inverter manufacturers are also aware of this and support their customers in meeting their contractual requirements?

4.2.3. AEMO's conclusion

Appendix F provides an overview of the draft Information Collection Framework to provide stakeholders with an opportunity to comment.

In regards to remote data acquisition and changes to inverter settings, AEMO is of the view that OEMs accessing inverter details these would generally not be integrating DER installation data with the NMI for that installation. The role of the DER Register is to create this interface with AEMO's systems. Regardless, AEMO recognises this functionality may create future opportunities and will consider access for suitably accredited third parties in the future (Appendix F).

AEMO has considered various stakeholder views in developing the draft DER Register Information Collection Framework and identifying actors associated with this framework. AEMO is of the view that the draft framework supports the DER Register principles as outlined in the Issues Paper, and the National Electricity Objective. Further details are provided in Appendix F for stakeholders to consider.

AEMO welcomes stakeholder feedback on these matters and will continue to refine this with stakeholders through Delivery Team 2.

4.3. Use of default values and auto population

4.3.1. Issue summary and submissions

Most stakeholders supported the use of methods to streamline data entry for the DER Register to limit data handing and avoid human error in data entry. DNSPs supported the role of the AS4777 standard in establishing default data[36] and the ability for DNSP established default inputs for specific DER installations (and connection processes)[37]. The CEC and some DNSPs supported the role of existing product databases in auto-populating DER information, with the CEC, Tesla, and some DNSPs suggested that the CEC

[36] Ausgrid, AusNet Services, Citipower Powercor, United Energy, SAPN and Energy Queensland submissions to first stage consultation.
[37] Delivery Team 2 Meeting 1 minutes.

'approved product' lists would be useful here[38]. Citipower Powercor and United Energy recommended that AEMO maintain this product database within its Market Settlements and Transaction Systems (MSATS)[39].

SAPN noted that relying heavily on existing databases may ignore data associated with non-inverter based DER[40], and Endeavour Energy suggested that care will still be required to ensure default data is confirmed or updated[41].

The CEC argued that the use of remote data acquisition for DER inverters would be a more effective and lower-cost approach to gathering DER data, and that widespread use of this approach may render the DER Register obsolete[42].

4.3.2. AEMO's assessment

AEMO's draft collection framework anticipates that DNSPs would be able to establish default DER installation data for self-defined classes of installations (for example, this would likely include basic, standard connections and could be extended to common negotiated connections). AEMO could support the initial data for these based on AS4777 or other commonly applied standards. However, AEMO's view is that DNSP-led definitions for default DER installation data will be the most efficient approach to managing differences between system designs and installation requirements across the NEM.

AEMO intends to utilise the CEC approved product lists to support auto-population of data, and is open to stakeholders recommending other lists that may be of value. However, the use of MSATS to house product lists would not be appropriate, as this implies that AEMO would also be accountable for the accuracy of these lists. Other parties such as the CEC already have a role in ensuring this. AEMO has not established this capability so considers it more efficient to utilise existing industry-accepted lists.

The DER Register system will track changes to default data and notify the DNSP to consider exceptions should they arise. Existing expertise will be supported by training material to support DNSPs and installers in ensuring fields are updated where this is required.

Remote data acquisition is one method of gathering information from inverters. However, the DER Register will deliver the most value where it aligns to and supports DER connection processes. This includes by requiring installers to confirm that device settings are consistent with connection agreements. Relying on remote reading for inverters does not appear to capture this location-specific information. Further, it is not available on all inverter models on the market and relies in the manufacturer's infrastructure to persist in the case of business failure.

AEMO supports the use of remote data acquisition to read inverter settings and validate data in the DER Register. Stakeholder input into how this can be enabled is welcome.

4.3.3. AEMO's conclusion

The efficiency of AEMO's draft collection framework and data model will be enhanced by calling upon DNSPs to provide default information in their desired format, and upon existing product databases where these are available. AEMO welcomes further stakeholder feedback on additional resources that may be of value in supporting auto-population.

[38] CEC, Tesla, SAPN submissions to first stage consultation.
[39] Citipower Powercor and United Energy submissions to first stage consultation.
[40] SAPN submission to first stage consultation.
[41] Endeavour Energy submission to first stage consultation.
[42] CEC submission to first stage consultation.

4.4. Submission frequency

4.4.1. Issue summary and submissions

AEMO stated in the Issues Paper that DER generation information should be submitted on an ongoing basis, as DER are installed, modified or removed at a site.

Endeavour Energy noted that data collected by installers on a site (DER data) should aim to be as close as possible to real time, and aggregate site data that is collected following NSP approval of a connection application (DERID generation) should be populated shortly after approval. This near-real-time input of data would allow installers access to DER information as part of the commissioning process.

SAPN suggested that monthly DER Register submissions by NSPs would be more appropriate. This would balance early and late information provided to the NSP for submission as well as data cleansing activities.

4.4.2. AEMO's assessment

In assessing this issue, AEMO considered the following points:

- The rationale of establishing a DER Register is to give NSPs and AEMO visibility of where DER are connected to help in planning and operating the power system as it transforms. AEMO believes this objective will be best achieved with frequent updating of the DER Register.
- AEMO has considered the broader DER Register Information Collection Framework, which was discussed in Sections 4.1 and 4.2.
- AEMO recognises the perspectives put forward by both Endeavour Energy and SAPN. An effective frequency should balance the needs to align to existing connection processes, while also balancing the potential receipt of delayed information and NSP validation processes.
- AEMO has also considered efficient compliance costs in the context of any ongoing information submission requirement.

4.4.3. AEMO's conclusion

The Draft DER Guideline will specify that submission to the DER Register will be on an ongoing basis, triggered by a DER installation, upgrade (or other change) or decommissioning event. DER generation information must be submitted to the DER Register no later than *20 business days* following the date of installation, change or decommission.

4.5. Submission format and storage

4.5.1. Issue summary and submissions

The AEMO Issues Paper proposed that the DER generation information reside in MSATS and the method of data submission also leverage existing MSATS processes.

AEMO received mixed support for leveraging the existing MSATS platform and processes for submission and storage of DER generation information.

- CitiPower Powercor and United Energy were supportive of using MSATS.
- Ausgrid was supportive, however required further clarity on the collection and submission framework to understand whether existing MSATS data exchange protocols would need to be augmented.
- Energy Queensland was supportive, however noted that they would also support the investigation of alternative arrangements for the submission of DER information.

- SAPN strongly prefers a solution that is not linked to MSATS.

Several submissions also questioned whether hosting DER generation information in MSATS would necessitate schema upgrades for other Market Participants[43].

AEMO proposed the use of an API for submission in the Issues Paper. SAPN, FormBay, and Energy Queensland supported this proposal, noting that it would provide useful functionality, including facilitating the transmission of information from the installation site to the DER Register. Energy Queensland also noted that it would support the investigation of alternative arrangements for the submission of DER information.

4.5.2. AEMO's assessment

In determination of the submission format and storage architecture for the DER Register, AEMO considered the following points:

- AEMO notes the varied preference for the DER Register residing in MSATS and the support for pursuing alternate arrangements.
- AEMO notes that participants were generally supportive of the provision of an API for submission to the DER Register. AEMO considers that provision of services via an API provides the most flexible and efficient interface supporting both NSPs and third parties providing services to installers. AEMO considers that any proposed solution for NSP submission to the DER Register should align with technology pursued for access[44] to minimise the burden on NSPs.
- AEMO is considering the security of information under the preferred storage options, to reduce the risk of any inadvertent disclosure of personal information or confidential information.
- AEMO is considering the options for data storage for the DER Register but notes that regardless of storage architecture, MSATS will be used for validation, lookups, and reporting. The DER Register information is intended to be identified by NMI and hence dependant on NMI standing data managed in MSATS. Further, MSATS interfaces and notifications may also be used regardless of the DER Register storage architecture.

4.5.3. AEMO's conclusion

The Draft Guideline will specify that the DER Register will be stored in an AEMO managed Database with data encrypted at rest and access protected with appropriate authentication and authorisation.

DER generation information will be submitted through an API or Web interface. Additional technical information will be released to inform submission format and API development. These will include:

- An additional "plain language" guideline "Guide to the DER Register – how to submit and receive information".
- Generated Swagger file. Further information can be found in the guide to AEMO's e-hub APIs[45], AEMO's API portal[46]. Also note that the standard AEMO uses for APIs is the OpenAPI Specification (OAS)[47].
- List of resources available in the API. AEMO's preliminary thinking on the provision of API resources is detailed in Error! Reference source not found..

[43] Red and Lumo Energy and Energy Australia submissions to first stage consultation.
[44] See section 4.5 for a discussion on the DER Register submission format and storage.
[45] Available on the AEMO website at: https://www.aemo.com.au/-/media/Files/Electricity/NEM/IT-Systems-and-Change/2018/Guide-to-AEMOs-eHub-APIs.pdf.
[46] Accessible via: https://apiportal.prod.aemo.com.au/.
[47] For more details, see OpenAPI-Specification: https://github.com/OAI/OpenAPI-Specification.

4.6. Integration of DSP and DER generation information storage

4.6.1. Issue summary and submissions

AEMO's Issues Paper asked Consulted Persons for their views on the alignment of DSP information and DER generation information for the DER Register. The Issues Paper proposed separate storage and submission frequencies for *DER generation information* and *DSP information,* which comprises the *DER register information*:

- *DSP information* was proposed to continue as per the current solution; an annual submission of data to be stored in an existing AEMO managed database.[48]
- *DER register information* was proposed to be submitted on an ongoing basis[49] and stored in new MSATS tables.

The following discussion summarises stakeholder views on these two points.

Storage

The majority of submissions[50] did not foresee any issues with the storage proposal. The Submissions raised risks around the separate storage of DSP and DER generation information including the issues of alignment, responsibilities, and resolving data quality issues.[51]

Ausgrid noted that if the separate storage architecture has implications on information accessibility or data security, then this should be addressed in further stakeholder consultation and solution development.

Frequency

Stakeholder submissions indicated that while several stakeholders[52] did not identify material impact in collecting DSP information less frequently than DER information, there is a potential risk of misalignment between the data sources, where there is crossover between the information collected.[53] Tesla argued that it is unclear why different processes and timelines are needed for DER and DSP information[54].

4.6.2. AEMO's assessment

NER clause 3.7E(b)(2) specifies that the DER register must include any DSP information which in AEMO's reasonable opinion will assist NSPs to meet their regulatory obligations or requirements and/or assist AEMO in the exercise of its statutory functions under the Rules. AEMO has considered the following key areas in determination of this issue.

Privacy

The AEMC noted in its Final Determination[55] that there is currently no formalised data sharing arrangement that supports AEMO sharing DSP information with third parties. They also note that AEMO will need to consider privacy and confidentiality arrangements when disclosing the data obtained from other sources to NSPs and conclude that AEMO should be able to share the locational and technical characteristics of

[48] See the DSP information guideline for further information available at: https://www.aemo.com.au/-/media/Files/Stakeholder_Consultation/Consultations/Stakeholder_Consultation/Consultations/Electricity_Consultations/2017/DSPIG/Demand-Side-Participation-Information-Guidelines.pdf

[49] See Sectionsection 4.4 for a discussion on the DER generation information submission frequency.

[50] Ausgrid, Endeavour, FormBay, Citipower Powercor, United Energy did not see any issue, while AusNet Services, Red and Lumo, Tesla suggested that a single data storage architecture was preferable.

[51] AusNet Services and Energy Queensland submissions to first stage consultation.

[52] Endeavour Energy, Citipower Powercor, United Energy, AusNet Services submissions to first stage consultation.

[53] Ausgrid and AusNet Services submissions to first stage consultation.

[54] Tesla submission to first stage consultation.

[55] AEMC, Register of distributed energy resources, Rule determination, 13 September 2018, p62.

devices in the DER register with NSPs in relation to their network areas. AEMO notes that while DSP information does contain some locational and technical characteristics, the majority of DSP data is contractual information.

AEMO is further considering what DSP information could be provided to DNSPs in the context of its privacy and protected information obligations.

Intersection of DSP and DER datasets

The DER Register is intended to contain information on the physical attributes of DER systems, which can be recorded and updated as installations are installed, updated and decommissioned. The DSP information comprises records of the curtailment of non-scheduled load or the provision of unscheduled generation in both contractual and non-contractual arrangements between a Registered Participant and a person.[56]

Further the DER Register will contain information on installations at individual sites (identified by a NMI). While DSP information contains information down to a NMI level, the information provided is on an aggregate capacity basis across a 'program'. For example, a hot water load control program may have 50,000 NMIs listed under the program with an available load reduction of 88MW, however the available load response cannot be disaggregated to each NMI. The DSP information is structurally different to the proposed DER generation information and there are different granularities of data contained within the datasets.

Storage

AEMO agrees with the majority of submissions that there should be no issue with the separate storage of *DSP information* and *DER generation information*, as long as the ease of access is not affected.

Frequency

AEMO agrees with submissions that there is a risk of misalignment between data sources, due to asymmetric collection cycles. Due to the minimal crossover between the data collected under the DSP and DER Information Guidelines, AEMO believes that this risk is immaterial and can be handled adequately when accessed and reported on in conjunction.

4.6.3. AEMO's conclusion

AEMO notes that although the DER generation information is currently proposed to be stored in an AEMO managed database other than MSATS, AEMO does not intend to immediately pursue a combined storage architecture for the DSP and DER generation information. However, combination of the DSP and DER generation databases is flagged for alignment in a future iteration of the Register. AEMO also concludes that, where possible, the DER Register will also be used for validation and reconciliation of the DSP Information.

4.7. Data access for NSPs

4.7.1. Issue summary and submissions

AEMO proposed a number of options in the Issues Paper for NSP access to the DER Register. These included:

- NMI discovery for retrieval of individual site information.

[56] See DSP Information Guidelines, available at https://www.aemo.com.au/-/media/Files/Stakeholder_Consultation/Consultations/Consultations/Electricity_Consultations/2017/DSPIG/Demand-Side-Participation-Information-Guidelines.pdf.

- Use of existing MSATS reports (including C1, C4, and C7, henceforth called C*) and the potential creation of a new report.
- API access, enabling the development of custom reports.

All NSPs submissions indicated positive[57] or neutral[58] support for API access to the DER Register. FormBay recommended access via an API to allow stakeholders flexibility to create their own methods to access DER Register information. Endeavour Energy also suggested that where there is a common need across users, a library of pre-existing reports would also provide benefit in addition to the flexibility to design individual reports, already inherent in the API access option.

Retailer submissions generally sought clarity on whether they can access the DER Register while Red and Lumo Energy indicated that many market participants have not yet adopted APIs and encouraged AEMO to consider the implications of this[59].

Several Consulted Persons also commented on the usefulness of existing NMI discovery and C* reports.

- Endeavour Energy was strongly supportive of the inclusion of NMI discovery and C* reports, noting that NMI discovery would be particularly useful for installers, so it is aware of the approved connections and configurations of any existing systems. The C* reports are considered as more transactional based and are desirable as per existing schedules.
- Ausgrid noted that DSNPs will require reports and interfaces to view DER Register information held in AEMO's systems, which could include NMI discovery or updated C* reports, while noting that it did not have a preferred process for accessing the DER Register.
- Ausgrid and Energy Queensland noted that a NMI discovery process could be useful.
- FormBay noted that an API could provide similar report functionality to the NMI discovery and other relevant C* reports.
- Citipower Powercor and United Energy noted that they did not view the NMI discovery for DER as useful and C* reports could be an option, but preferred an API solution.
- SAPN did not support an MSATS solution (including reporting) and cited a preference for one API solution to be used for both submission and extraction of information.
- All DNSP submissions noted a preference for, or that there are merits in, an API solution.

4.7.2. AEMO's assessment

In determination of this issue, AEMO considered the following points:

- AEMO notes that all NSPs that provided submissions were receptive to development of APIs to provide access to the DER Register. Views on the provision of NMI discovery and C* reports were mixed.
- AEMO considers that any proposed solution for NSP access to the DER Register should align with technology pursued for submission format[60] to minimise the burden on NSPs.
- AEMO agrees with FormBay that the API could provide similar reports to the NMI discovery and other relevant C* reports.

[57] AusNet Services, CitiPower Powercor, Endeavour Energy, Energy Queensland, SAPN, United Energy submissions to first stage consultation.
[58] Ausgrid submission to first stage consultation.
[59] Red and Lumo submission to first stage consultation.
[60] See section 4.5 for a discussion on the DER Register submission format and storage.

- Access to the DER Register must be managed in a manner consistent with AEMO's obligations to protected confidential information under the National Electricity Law and the NER, and personal information under the Privacy Act.
- AEMO notes that the rules made by the AEMC specify which market participants are permitted to access the DER Register information. The rule does not include retailers.

4.7.3. AEMO's conclusion

AEMO will provide access for NSPs to the DER Register, as envisaged by the NER 3.7E(n).

DER generation information will be submitted through an API or Web interface. Additional technical information will be released to inform submission format and API development. These will include:

- An additional "plain language" guideline "Guide to the DER Register – how to submit and receive information".
- Generated Swagger file. Further information can be found in the guide to AEMO's e-hub APIs[61], AEMO's API portal[62]. Also note that the standard AEMO uses for APIs is the OpenAPI Specification (OAS)[63].
- List of resources available in the API. AEMO's preliminary thinking on the provision of API resources is detailed in Error! Reference source not found..

Through the design of the Information Collection Framework AEMO is assessing and will be developing the data governance and privacy arrangements that allow third-parties, such as installers and application developers, to access appropriate levels of information. The Information Collection Framework will maintain appropriate protections of information which is confidential information under the NER, including the NMI.

4.8. Emergency Services access

4.8.1. Issue summary and submissions

The AEMC final determination noted that the Rule allows AEMO to provide DER register information to an emergency services agency if requested for the purposes of that agency's response to an emergency or for planning in relation to emergency responses.[64] A key reason for this, as raised in COAG's rule change request, was safety risks to emergency services personnel not having adequate information to respond effectively to emergency events on a site with a battery or other DER[65].

One submission, from the University of Sydney, noted that "there seems to be a lack of consideration about the provision and use of [DER Register] data for emergency planning/ first responders … Please consider giving better access to these groups."

No submissions were received from emergency services agencies in response to the Issues Paper and no emergency services representatives were present at any of the subsequent forums.

4.8.2. AEMO's assessment

In determination of this issue, AEMO considered the following points:

[61] Available on the AEMO website at: https://www.aemo.com.au/-/media/Files/Electricity/NEM/IT-Systems-and-Change/2018/Guide-to-AEMOs-eHub-APIs.pdf.
[62] Accessible via: https://apiportal.prod.aemo.com.au/.
[63] For more details, see OpenAPI-Specification: https://github.com/OAI/OpenAPI-Specification.
[64] AEMC, Register of distributed energy resources, Rule determination, 13 September 2018, p.69.
[65] COAG Energy Council, Register of distributed energy resources, rule change request (rule change request), October 2017, p. 6.

- Purpose of the Rule – NER clause 3.7E(q) specifies that AEMO may provide relevant DER Register information if requested by an emergency services agency.
- Lack of engagement from emergency services agencies – AEMO had made best endeavours to engage emergency services groups on their need and access to the DER Register, however have had no response, making tailoring a solution to meet the needs of emergency response challenging.
- Cost – there is a risk that building an access portal without engagement with emergency services will lead to underuse of the portal.
- Work by other key agencies – AEMO understands that Emergency Services Agencies are currently working with other agencies to obtain first responder data.

4.8.3. AEMO's conclusion

AEMO is developing an API to enable Emergency Services Agencies to retrieve data for the purposes outlined in NER3.7E(q). AEMO intends to work with key agencies to ensure our solution aligns with existing processes, meets the Emergency Services Agencies requirements and ensures appropriate protection of confidential and personal information.

4.9. Data content

AEMO's issues paper included a draft DER Register data model to review and provide feedback. Nine submissions were received with commentary on the data content, and further discussions have been had in forums since the release of the Issues Paper (as noted in Section 2.3). The submissions included specific feedback on data fields as well as comments on the collection of non-inverter DER information and general comments on the data model structure.

4.9.1. Field-specific feedback

This section lists summarised comments made by Consulted Persons on certain fields within the data model, alongside AEMO's assessment of the issues raised. Note that full details of comments made in seven submissions to the Issues Paper are available in Appendix B and meeting minutes are available on the AEMO website[66].

Proposed new data fields

No.	Level	Field	Comments	AEMO's assessment
1	DER Installation	Connection Agreement 'Job number'	Used to identify the DER installation approval and associated terms in the DNSP's systems (Delivery Team 2).	This field will create a traceable connection to the DNSP's connection approvals and be used as a component of identity and access to the DER register.
2	DER Installation	Installer details	Important to enable a compliance or audit process or system to be implemented more effectively (Delivery Team 2)	This field has been included as enables a more efficient compliance or audit process or system.
3	DER Installation	Total generating capacity	Provide verification of installer compliance to connection requirements. (Endeavour Energy)	This field has not been included as the NSP can provide this verification service with existing collected information.

[66] Available at: https://www.aemo.com.au/Stakeholder-Consultation/Consultations/NEM-Distributed-Energy-Resources-Information-Guidelines-Consultation?Convenor=AEMO%20NEM. Available at: https://www.aemo.com.au/Stakeholder-Consultation/Consultations/NEM-Distributed-Energy-Resources-Information-Guidelines-Consultation?Convenor=AEMO%20NEM

No.	Level	Field	Comments	AEMO's assessment
4	DER Installation	Total energy storage capacity	Provide verification of installer compliance to connection requirements. (Endeavour Energy)	This field has not been included as the NSP can provide this verification service with existing collected information.
5	DER Installation	Number of Phases available (1,2,3) Number of Phases with DER installed (1,2,3)	Interest in knowing whether the NMI associated with the premises is a single- or two-phase NMI or if the DER is connected to one or two phases but is at a three-phase premises. This detail would be valuable for DNSPs to determine network loading/efficiency at a MV/substation level, especially with high levels of aggregated DER. (Energy Queensland)	Two new fields have been added at the NMI level - (1) the number of phases available at the site and (2) the number of phases that have DER installed. Note this is *not* intended to identify the specific phase(s) to which the DER is connected (i.e. red, white or blue).
6	DER Installation	Volt/Var/Watt limits	Provide verification of installer compliance to connection requirements. (Endeavour Energy)	This field has not been included as the NSP can provide this validation service with existing collected information.
7	DER Installation	Confidence flags	Needed to vet and qualify the quality of data. (SAPN)	This field has not been included as the data capture process and built in validation processes negate the need for this flag.
8	DER Installation	Feed in management flag	Needed to vet and qualify the quality of data. (SAPN)	This field has not been included as the data capture process and built in validation processes negate the need for this flag.
9	AC connection	AC connection group count	The AC connection level should have a group count, similar to the DER Device level. AC connections (e.g. inverters) would not necessarily be the same make/ manufacturer, so the data model should account for DER devices going to different types of AC connections. (Meeting on collection).	This field has been included as it provides users an improved understanding of the DER installation.
10	~~AC Connection~~	~~Number of AC Connections~~	~~Provide information on how many AC Connections exist at the NMI~~	~~This field has been included as it provides users an improved understanding of the DER installation.~~
11	AC connection	Serial number/s	Important to enable a compliance or audit process or system to be implemented more effectively (Ausgrid) Inverter serial number to enhance use of remote data acquisition as a form of data validation in the future (AEMO).	This field has been included as it provides users an improved understanding of the DER installation. Future settings changes should be traceable to the device, which requires the serial number to affect.
12	AC connection	Decommissioned systems	Ensure awareness of when a DER installation is removed or has failed with no owner intention to recommission. (Energy Queensland)	The data model already includes fields for active and inactive devices and AC connection status. 'Decommissioned' is now an additional status option.

No.	Level	Field	Comments	AEMO's assessment
13	AC connection	Non-inverter small generating unit protection modes such as: • RoCoF • Anti-Island • Vector shift • Inter trip scheme • export limiter/prevention • Volt/var control • Power factor control	Believes it is relevant to include protection modes for non-inverter DER.(Citipower, Powercor, United Energy).	See section 4.9.2 and 4.9.5, below, for a discussion on non-inverter fields. Some of these have been included. This field has been expanded to include all forms of central protection, regardless of DER type.
14	DER device	Degradation rate	Only for solar PV. Inclusion of degradation rates in forecasting models may increase accuracy (FormBay).	This field has not been included. This characteristic is considered used for forecasting etc by approximating through modelling. Alternatively, manufacturer data can be used to source this.
15	DER device	Photographic of the installation and serial numbers of the products	For use by emergency services personnel. (FormBay).	This field has not been included. While it is feasible to capture photographs AEMO has significant concerns around privacy issues relating to the capture, storage, and transmission of photographs. Further, stakeholders have varied views of the value of this.
16	DER device	Panel orientation	Only for solar PV. Has a significant impact on the relative output of the panels. A consideration of inclusion of this attribute is recommended due to its impact on DER output at different times of day. (Energy Queensland)	This field has not been included. This information is most useful for larger / commercial grade systems. These installations are often on flat surfaces, or have tracking facilities, both of which facilitate optimised panel orientation. Domestic installations have more opportunities for panels to be installed at various orientations, making the capture of this information less useful.
17	DER device	Panel tilt	Affects DER output, but EQ considers the variables too great to warrant collection. (Energy Queensland)	See response in item 16 above.
18	DER device	Central protection	For DER installations where DNSPs specify the need for additional forms of protection above those inbuilt in an inverter (Energy Queensland and others.)	This field has been included to capture the various forms of central protection in use by DNSPs for larger DER installations.

Proposed fields to remove

No.	Level	Field	Comments	AEMO's assessment
1	DER Installation AC connection DER device	Status	Removal of "Inactive" requirements in "Status" at DER Device level, and ideally "AC Connection" and "DER Device" levels. (Energy Queensland)	This field has been removed at the NMI level, but retained at the ACconnection and Device levels. NMI status is available through NMI standing data, and so this field can removed from the NMI level. The status at the other two levels is required information for AEMO.
2	DER Installation	Central protection settings (Under-frequency protection (F<), Over-frequency protection (F>), Undervoltage protection (V<), Overvoltage protection 1 (V>), Overvoltage protection 1 (V>>))	Energy Queensland provided clarification on the application of central protection values under AS/NZS 4777.1:2016, which were identified in the DER Installation level of the data model. They note that centralised protection does not apply to the majority of inverter connections less than 30MW, which is the majority of installations captured by the DER Register.	These fields have been retained and some new fields have been added to capture the various forms of central protection used for larger DER installations.
3	AC connection	Inverter demand response modes (including 'Reactive power supply' and 'Reactive power sink' fields)	As very few inverters have been installed with Demand Response Enabled Devices, and implementation of Demand Response Mode '0'(DRM0) is not specified in any connection standards, Energy Queensland recommends that a 'Null' option be added to the proposed multi -select options, and that 'Null' be set as the default value. (Energy Queensland)	This field has been removed. It is understood that very few inverters are installed in this mode, making the field inefficient to capture and store.
4	DER device	Sub-type	Device sub-type: Notes the value of device sub-type information, e.g. battery chemistry, for emergency services, however, question the relevance of collecting data on panel type as the variation in generation output per kilowatt (kW) of rated capacity over the life of the panels in minimal. (Energy Queensland)	This field has been retained. Device subtype is useful (to AEMO) in understanding the type of technology being employed in order to adapt forecasts accordingly.

Other field changes

No.	Level	Field	Comments	AEMO's assessment
1	DER Installation	Export limit	These fields were stated kW. Energex and Ergon Energy Network currently record this information in kVA for values up to 30 kVA, an approach which aligns with the Clean Energy Council's publication of AS/NZS 4777- compliant inverters. We suggest that AEMO consider this alternative parameter for the DER Register (Energy Queensland).	AEMO agrees to record this information in kVA as it is consistent with current standards used in the industry.
2	AC connection	Inverter device capacity		

No.	Level	Field	Comments	AEMO's assessment
3	DER Installation AC connection DER device	Data source/providers	Greater clarity is needed around 'data source/providers' in the table, potentially via two columns: one headed 'Data source' and another headed 'Data provider to Register', as these are often different entities. (Energy Queensland)	AEMO has removed this column as it is considered unnecessary.

4.9.2. Non-inverter information

The data model in the Issues Paper proposed several 'non-inverter' specific fields to accommodate other DER technologies including voltage/ reactive power regulation (voltage set point, deadband, droop, base for droop, reactive power source limit, reactive power sink limit, fixed power factor, fixed power factor quadrant), ramp rate and frequency response mode (frequency deadband, frequency droop).

Several submissions flagged that additional consultation and refinement is needed around the non-inverter information in order to correctly characterise and collect relevant data[67].

Specific feedback on the non-inverter fields included:

- It was also suggested that the non-inverter information would be better placed in the DER installation level of the data model as these parameters are specified by the NSP in the connection application[68].
- Addition of other protection modes including: RoCoF, anti-island, inter trip scheme, export limiter/prevention, volt/var control and power factor control[69].
- Different views were presented on the usefulness of ramp rate and frequency response mode fields. Energy Queensland notes that they only specify these fields for registered generators, which are out of scope for the DER Register. However, CitiPower Powercor and United Energy agreed with the inclusion of these variables.
- Energy Queensland noted that there are challenges for including protection settings for inverter-based technologies due to the lack of legislative requirements for compliance to these settings. They also note that the ENA National DER Connection Guidelines are intended to bring greater alignment in this space an suggests that there may be benefit in AEMO consulting further with the ENA.

4.9.3. General Data content feedback

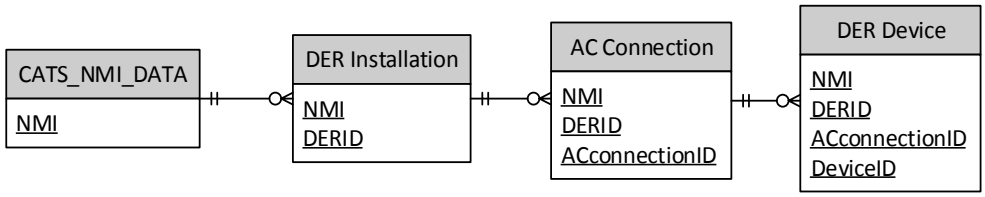
Several submissions indicated some concern over the volume of data proposed in the draft data model presented in the Issues Paper[70]. Energy Queensland expressed the view that this level of data would create an onerous administrative burden on DNSPs and installers[71]. Ausgrid and AusNet Services noted in their submissions that it would be beneficial for AEMO to provide additional information on why the fields are required, to ensure that the use of the DER information is transparent to other market participants.

4.9.4. Data model structure

The proposed structure of the data model in the Issues paper included four levels as shown in Figure 1.

[67] See Ausgrid, AusNet Services and Energy Queensland submissions.
[68] See Ausgrid and Endeavour Energy submissions.
[69] See CitiPower Powercor and United Energy submissions.
[70] See SA Power Networks and Energy Queensland submissions.
[71] Also see section 4.3 for AEMOs approach to auto population of fields in the data model.

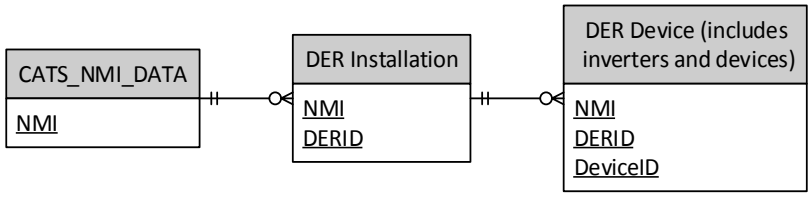
Data model entity relationship diagram presented in the Issues Paper



The data model structure was discussed in the DER Register meeting on collection[72] and DER register meeting with DNSPs[73]. In both meetings (and some formal submissions) the purpose of data at the DER Installation level was questioned[74]. It was noted in the DER Register meeting on collection (1 February 2019) that the purpose of the DER Installation level is for DNSPs to record DER information related to the aggregate site, while the equipment information, contained in the AC Connection and DER Device levels, could be filled in via a combination of default values, installer input and auto-population (discussed in Section 4.3).

Discussions in the meeting held with DNSPs on 18 December 2018 included commentary that maintaining the AC Connection to DER Device mapping would be onerous and suggest the option (Figure 2) as a preferable data model that is aligned with the current visibility of DNSPs and Renewable Energy Certificates[75].

Data model "B" proposed by AEMO in DSNP forum



Several submissions commented on the method that would be used to issue DERIDs (identifier in the data model DER installation level) to participants.[76]

- Ausgrid suggested that an NSP issues a DERID at the time of approval of a connection application according to an AEMO allocation procedure.
- CitiPower Powercor and United Energy suggested that the DERID be created and provided to AEMO by the NSP when they create, modify or decommission DER information in their systems.

4.9.5. AEMO's assessment

In determination of this issue, AEMO considered the following points:

- The data model focuses on the collection of data that would assist AEMO in the development of load forecasts or the performance of power system security responsibilities[77] and assist NSPs to meet their regulatory obligations or requirements.

[72] Minutes available at: https://www.aemo.com.au/-/media/Files/Stakeholder_Consultation/Consultations/NEM-Consultations/2019/DER2019/DER-register/DER-Register-meeting-on-collection_minutes.pdf.
[73] Minutes available at: https://www.aemo.com.au/-/media/Files/Stakeholder_Consultation/Consultations/NEM-Consultations/2019/DERDER-register/DER-Register-variables-for-DNSP-discussion---minutes.pdf.
[74] SA Power Networks and Tesla questionedquestion the DER installation level in their submission.
[75] AusNet Services submission to Issues Paper consultation, p. 6.
[76] Ausgrid, Energy Queensland, CitiPower Powercor, United Energy, and Energy Queensland.
[77] For a description of the relevance of DER to forecasting and power system modelling, see AEMO, DER Register Information Guidelines, Issues Paper, 29 January 2019, pp. 7-8.

- The AEMC final determination noted that it is important that the costs of the register will not be disproportionately large in comparison to its expected benefits and, where possible, existing mechanisms should be leveraged[78].
- AEMO acknowledges that some Consulted Persons raised concern around the volume of data proposed. AEMO has considered the costs of efficient compliance in this context. AEMO has reviewed the necessity of all fields in the data model and those fields which remain in this proposal are required in AEMO's view. AEMO considers that its approach to the Information Collection Process will assist in ensuring efficient compliance, noting the opportunity for NSPs to provide default values and for several fields to be auto-populated by calling upon existing product databases where these are available[79].
- AEMO notes that the collection of information on non-inverter technologies is important to the development of load forecasts or the performance of power system security models, however agrees with the submissions received that further consultation is needed to refine the variables requested for non-inverter technologies.
- AEMO considers that the separation of AC connection (e.g. inverter) information and DER device (e.g. solar PV panels) to be important for the accuracy of forecasting models, for example correctly modelling system export limitations or trends in under- or over-specification of DER devices to AC connections.
- AEMO has developed a set of representative DER system configurations (see Appendix C), which have been used to ensure the data model structure is fit for purpose and will adequately capture information on the majority of DER sites.
- AEMO notes that NSPs have indicated a preference for aggregate site information to be stored in a site-specific table and agrees that aggregate site information should remain separate to individual equipment information.
- AEMO notes that the Draft DER Guidelines specify that the DER Register will be stored in an AEMO managed database, which is separate from MSATS. However, it remains important for DER Register information and NMI Standing Data to be combinable, to support effective forecasting and system security modelling. As such, level 1 of the data model (CATS_NMI_DATA level), as noted in the Issues Paper, is being removed. However, the NMI identifier field will be retained and will become one of the primary fields for identifying the DER installation and enabling installer access to the DER Register for that installation (level 2 in the issues paper). See Error! Reference source not found. below.

4.9.6. AEMO's conclusion

AEMO determines to make the following amendments in the Draft Guidelines:

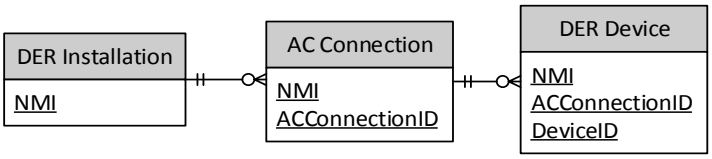
- AEMOs conclusion on field specific feedback is contained in section 4.9.1.
- AEMO notes that the additional fields suggested by CitiPower Powercor and United Energy may apply at either the DER Installation level (central protection) or the DER Device level in some cases where there are larger DER installations (or in embedded networks for example). AEMO agrees with Energy Queensland that not all these fields are required and has made some adjustments. AEMO welcomes stakeholder feedback on whether the list now captures all forms of protection in use and will continue to refine this with stakeholders through Delivery Team 1.
- To reduce the administrative burden on DNSPs and installers, the data model will be enhanced by calling upon DNSPs to provide default information in their desired format, and upon existing product

[78] AEMC, Register of distributed energy resources, Rule determination, 13 September 2018, p.9.
[79] See Sectionsection 4.3 for further information on the use of default values and auto-population.

databases where these are available (Section 4.3). AEMO has also considered proposals to remove specific fields and has provided responses in Section 4.9.1.

- The initial four-level data model has been contracted to three levels (Error! Reference source not found.). The DER Installation level will now be identified by NMI (instead of DERID), however will still contain the aggregate information on DER Installation, previously identified under the DER installation level.

Data model that is represented in the draft DER Register Information Guidelines



4.10. DER Register report

4.10.1. Issue summary and submissions

AEMO is required to publish a report of aggregated DER register information on its website, where the Guidelines specify the contents, form, timing and aggregation of the report[80]. AEMO's Issues Paper stated that AEMO intended to provide a monthly report in csv (data) and graphical format on the AEMO website. The details AEMO intend to provide include: region, installed capacity (MW, MWh) and fuel type, which are, in general, to be aggregated by postcode. AEMO will review the final report to ensure in each case the aggregation is appropriate to ensure there has been no inadvertent breach of AEMO's obligations with respect to personal information or confidential information.

Submissions received in relation to the DER Register report noted:

- Ausgrid suggested that the following aggregate information be considered for the DER register report: quantity of DSP, types of DSP, and class of market participant, depending on confidentiality considerations.
- Energy Queensland noted that "if DER is being filtered by fuel type, but then aggregated by postcode and shown as 'Null' if no more than 10 in that postcode region, many unique projects may not show on the register reporting at all e.g. Hydro, biomass, geothermal."
- The majority of submissions supported aggregation at a postcode level for public reporting[81]. Energy Australia recommended "aggregation of capacity at the transformer or feeder level. This will enable retailers to identify opportunities to help customers and the network better." FormBay also suggested "aggregation at a street level, as this information would allow NSPs to consider network impacts on a street by street basis."
- All submissions that commented on the reporting frequency agreed that a monthly report was suitable[82].

4.10.2. AEMO's assessment

In determination of this issue, AEMO considered the following points:

- AEMO's approach to reporting on DER register information will comply with the protected information provision of the NEL and ensure compliance with the Privacy Act.

[80] See NER clause 3.7E(f), (l) and (m).
[81] Citipower Powercor, United Energy, Energy Australia, Energy Queensland, Endeavour Energy, Tesla and Ausgrid submissions to first stage consultation.
[82] Ausgrid, Energy Queensland, FormBay and SAPN submissions to first stage consultation.

- AEMO agrees with stakeholders that the aggregation must balance providing value from the DER Register with the need to protect privacy and confidential information. These matters are taken into account when designing the scope and content of the report as contained in the Guidelines. In addition, the report will remain subject to review to ensure appropriate privacy and confidentiality protections are maintained in practice.
- AEMO understand that there may be additional value in aggregating data at a feeder or street level and can work with stakeholders to identify the value that this opportunity would provide, and whether in practice this opportunity can be progressed. However, AEMO also notes that DNSPs already have this capability and would be required to provide AEMO with the associated NMI lists to aggregate at this level.
- While AEMO recognises Ausgrid's point that publication of DSP information at an aggregate level may be desirable, the DSP source data is organised at a spatial level that is not compatible with the DER generation information (as noted in Section 4.6).

4.10.3. AEMO's conclusion

The Guidelines will include the requirement to publish a monthly DER register report in a csv data format and graphical format on the AEMO website. The DER register report will contain DER register information by region, installed capacity (MW, MWh) and fuel type, which are to be aggregated at a postcode level and state level. AEMO will only publish data where it is comfortable that privacy and confidentiality of protected information is preserved in the aggregation group (postcode or state).

4.11. Privacy

4.11.1. Issue summary and submissions

Some stakeholders raised concerns about data privacy and confidentiality in the design and execution of the DER Register. AusNet Services highlighted the role of privacy and confidentiality laws in relation to the data held in the DER Register, and how these would apply to installers accessing existing DER information in the DER Register. Their preference is for DNSPs managing access to the register to increase their oversight and compliance with related privacy and confidentiality laws. Further, AusNet Services seek to understand AEMO's approach to ensuring privacy and confidentiality within the proposed DER information collection framework[83].

Greensync focused on retailer customers expressing a view that the customer owns the data held in the DER Register and that they should reasonably expect that it is maintained securely and could potentially expect to be remunerated for its use in the DER Register[84].

4.11.2. AEMO's assessment

AEMO acknowledges that the data in the DER Register is important to consumers. AEMO has a track record of managing significant volumes of data securely, with a strong focus on privacy and confidentiality management of privacy requirements as well in relation to the power system and market, including data at a NMI level that is used to facilitate retail competition, metering, billing and settlements, amongst other things.

AEMO does not propose to provide remuneration for providing data to the DER Register.

[83] AusNet Services submission.
[84] Greensync submission.

4.11.3. AEMO's conclusion

AEMO is committed to ensuring the DER Register embeds a 'privacy by design' approach, so that the collection, sequencing, use, storage and disclosure of personal information is appropriately protected through the design of the Information Collection Framework and the practices, processes and systems that underpin the DER Register.

5. DRAFT DETERMINATION

Having considered the matters raised in submissions and at meetings and forums, AEMO's draft determination is to make the Distributed Energy Resources Register Information Guidelines in the form of Attachment 1, in accordance with clause 3.7E(g) of the NER.

APPENDIX A. GLOSSARY

Term or acronym	Meaning
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
API	Application Programming Interface
CEC	Clean Energy Council
CER	Clean Energy Regulator
COAG	Council of Australian Governments
CSV	Comma separated values
DER	Distributed Energy Resources
DNSP	Distribution Network Service Provider
DSP	Demand Side Participation
ENA	Energy Networks Australia
ISP	Integrated System Plan
MSATS	Market Settlement and Transfer Solutions
MW	Megawatt
MWh	Megawatt hour
NEM	National Electricity Market
NER	National Electricity Rules
NMI	National Metering Identifier
NSP	Network Service Provider
OAS	OpenAPI Specification
OEM	Original Equipment Manufacturer
OTR	Office of the Technical Regulator
PV	Photovoltaic
RoCoF	Rate of Change of Frequency
SAPN	South Australia Power Networks
STC	Small-scale Technology Certificate
VPP	Virtual Power Plant

APPENDIX B. SUMMARY OF SUBMISSIONS AND AEMO RESPONSES

No.	Consulted person	Category	Issue	AEMO response
1	AusGrid	Collection framework	The final data submission method should minimise the effort to submit data for all relevant parties as well as leveraging existing processes and systems. The CER process for creation of STCs is one of the most relevant and nationally consistent existing processes to leverage.	AEMO agrees. This is the approach that we are pursuing.
2	Ausgrid		Consideration needs to be given to types of DER Generation systems within the scope of the national DER register that do not lead to the creation of STCs.	Agreed. The draft collection framework accommodates larger DER.
3	Ausgrid		There has been minimal discussion regarding how the connection application process is incorporated into the collection, submission and validation of information for the DER register and Ausgrid would be keen to explore this in more depth in follow up stakeholder consultation sessions	Noted, Ausgrid has representation in Delivery Team 2 and AEMO is open to discussions on this matter.
4	AusNet Services		Suggest the following high-level approach: DNSP collects DER information as authoritative source while facilitating choice of approved installer applications: NSPs provide approval and job information (including approval ID) to application. Approved installer requires to input Approval ID and NMI to access information on application about the specific job to prevent security issues. Information is prepopulated on application from information provided from DNSP. Approved installer can add/modify devices and submit information to DNSP for validation. DNSP validates submission against connection agreement and performs any data corrections/follow-ups and site visits. - DNSP submits validated information to AEMO	Noted, Ausgrid has representation in Delivery Team 2 and AEMO is open to discussions on this matter.
5	Citipower Powercor United Energy		The collection of data should not be onerous and not slow down the approval and installation of DERs.	Noted.
6	Clean Energy Council		Data submission by installers should be streamlined into a single reporting procedure, implemented by AEMO, NSPs, CER, the CEC, inverter manufacturers and others, working collaboratively to avoid duplication of paperwork.	AEMO agrees. This is the approach that we are pursuing.
7	Clean Energy Council		The CER's Solar Panel Validation Initiative is an efficient data collection process and its suitability for the DER Register should be considered.	AEMO agrees. This is the approach that we are pursuing.

No.	Consulted person	Category	Issue	AEMO response
8	Clean Energy Council		The recent release of the Energy Networks Australia (ENA) National Connection Guidelines provides an opportunity to create a nationally streamlined process for information gathering and data entry, meeting the needs of AEMO and the NSPs.	Noted. AEMO have had meetings with the ENA on their guidelines. The ENA intend to reference these DER Register guidelines in their connection guidelines.
9	Energy Queensland		Envisage that one option is that most of or all the additional fields of data be captured through an expanded version of the existing CER process to create STCs.	AEMO agrees. This is the approach that we are pursuing.
10	Endeavour Energy		Support proposed submission as detailed in engagements after the issues paper publication.	AEMO agrees. This is the approach that we are pursuing.
11	FormBay		Recommend the model where the installer captures DER information on-site and passes that information either to the NSP for further validation or to AEMO directly via an API provided by the relevant NSP for the location of the installation.	AEMO agrees. This is the approach that we are pursuing.
12	SA Power Networks		Plans to receive DER installation information from installers from the state Office of the Technical Regulator (OTR) who is provided data via their online electronic Certificate of Compliance (eCOC) process. Believes it will be possible to obtain existing information and expand some eCOC fields to capture new information to satisfy the national DER register requirements.	AEMO does not have any scope to call upon the OTR to provide DER information into the DER Register.
13	SA Power Networks		From experience, installers do not submit information to SAPN or the OTR on the day of installation or day a system becomes operational. Often applications are submitted to SAPN days, weeks, or months before installation and to the OTR days or weeks after work has been completed.	AEMO intends to include measures to alert DNSPs when installers have not inputted or confirmed data in the DER Register.
14	SA Power Networks		The data should first flow to the NSP before being sent to AEMO.	Agreed.
15	Tesla		The DER information collection process visually represented in [the issues paper] does not provide sufficient information to explain how the data points outlined in Appendix B are actually collated and submitted.	Noted. See Section 4.1.2 for details.
16	Redback Technologies		There is value in developing a DER Register process that supports greater alignment of DNSP connection processes across the NEM, in line with ENA Connection Guidelines	Noted. See Section 4.1.2 for details.

No.	Consulted person	Category	Issue	AEMO response
17	Ausgrid	Collection actors	Consideration needs to be given in regards to holding the data source provider responsible for the quality and accuracy of the information rather than the DNSP.	Agreed. See section 0 for details.
18	AusNet Services		Our position is that this information is provided to DNSPs, as the DNSP is the authoritative source of information for the DER register. The DNSP is best placed to provide NMI and Connection Agreement information as well as following up with fields visits where data exceptions are found. It allows better visibility of authorised installers and DNSPs are motivated to ensure correct installations methods by correct approved personal, as well as escalation where this does not occur, or report recurrent non-compliant installers. DNSPs are responsible for the data and managing data exceptions therefore it makes sense that the logic to detect data exceptions lives with the DNSP, not a third party.	Agreed.
19	Citipower Powercor United Energy		Preferred position that the NSP is the only participant that submits data where the NSP is the data source/provider and the Installer submits data directly to AEMO where they are identified as the data source/provider.	AEMO requires DNSPs to be accountable for confirming all data entered in the DER Register.
20	Citipower Powercor United Energy		Seeks clarification on whether the information the Installer or Installation Software Provider is submitting is only the data where they are nominated as the data source/provider in the Data Model levels 3&4 (Appendix B of the consultation paper) or also where the NSP is listed as the data source/provider?	Fields where the installer is identified as the information source / provider are intended to be collected by the installer. The NSP is responsible for the provision of all DER information, as stated in the NER.
21	Clean Energy Council		Concerned the data collection process will create a significant additional administrative burden for DER installers.	Noted. See section 0 for details.
22	Clean Energy Council		Design of the data collection process must ensure that data will only be entered once by a single point of contact, and this should be the NSP.	AEMO disagrees for the reasons outlined in Sections 4.1.2 and 0.
23	Clean Energy Council		Where DER installers are required to submit information, the likelihood of poor, incorrect or incomplete data is very high. This is particularly the case for DER assets like storage where there is no incentive attached to the reporting. Without an incentive to undertake the detailed administrative work required, reporting compliance by installers is likely to be low.	Noted. See section 0 for details.

No.	Consulted person	Category	Issue	AEMO response
24	Endeavour Energy		A centralised system would require NSPs to provide DERID level aggregated data reflective of approvals to connect to the network and allow DER installers to directly input equipment level data upon installation. We support these proposed arrangements.	Noted.
25	Endeavour Energy		Encourage AEMO to develop a guideline that provides appropriate incentives to achieve installer compliance. The guidelines will need to clearly outline the requirement of installers so that NSPs are not unfairly held accountable for the actions or inactions of installers who fail to meet their obligations (and vice versa).	Agreed. The Guidelines will clarify that DNSPs are accountable for data entry. See section 0 for details.
26	Endeavour Energy		Agree with the nominated data source/providers for the DER information as outlined in the Issues Paper data model. We believe it is essential that AEMO's guidelines should assign accountability for the input of specific DER information on data source providers in an unambiguous manner. NSP (as per cl. 3.7E(d) of the NER) guidelines will need to clearly outline the collection requirements of installers, so the register remains accurate and fit-for-purpose.	Agreed. The Guidelines will clarify that DNSPs are accountable for data entry. See section 0 for details.
27	Greensync		Suggest that more work is required to validate assumptions regarding the extent to which installers are able to meet the requirements for DER data collection.	Noted. See section 0 for details.
28	Red and Lumo Energy		Not be supportive of this obligation for lodgement being placed on installers. The installers should be made to provide all required information as part of the approval process/ network connection agreements prior to installation.	Noted. See section 0 for details.
29	Tesla		All data relating to a DER asset should be submitted by a single point of contact – the NSP.	Noted. See section 0 for details.
30	Tesla		Where installers are also required to submit information in respect of individual assets the likelihood if poor, incorrect or incomplete data is very high. AEMO should consider incentives that could be introduced to encourage compliance from installers to provide information.	Noted. See section 0 for details.
31	Tesla		It is unclear who bears the responsibility for reporting on a physical change to an asset, particularly where the change is driven by the customer. Where the customer requests removal of an asset by a company who did not complete the original install, they will have no method to notify AEMO or the NSP of this change.	Noted. See section 0 for details.

No.	Consulted person	Category	Issue	AEMO response
32	Redback Technologies		The most effective solution involves integrating data requirements with the network connection application, with installers required to verify information once the connection application is approved as well as providing updated information for changes outside a new or modified connection. Any process which is dependant on manual rework by installers or is frustrated by a lack of integration between NSPs and AEMO (resulting in delays) will likely fall short of what the Rule intended and will result in DER installers incurring additional cost, and impact the quality and completeness of the information on the register.	Noted. AEMO will make endeavours to streamline data entry, but notes that DNSPs retain accountability for the data submission. See Appendix F.
33	Ausgrid	Data model: Use of auto-population	Useful to have discrete inputs for the AS4777 inverter settings in the data model. Different DNSPs may request different default settings for the Power Quality response modes (Volt-VAR, Volt-Watt) and these would need to be set as the time of installation and updated settings submitted to the DER register. The ability to also change these settings to other DNSP approved settings based on results from a site investigation may be beneficial.	AEMO agrees. The current collection framework supports DNSPs in establishing default DER installation data for self-defined classes of installations. See section 4.3 for details.
34	AusNet Services		AS/NZS 4777 inverters should be assigned default values for: Under frequency protection, Over-frequency protection, Undervoltage protection.	Noted. The current collection framework supports DNSPs in establishing default DER installation data for self-defined classes of installations.
35	Citipower Powercor United Energy		Recommend that where the data source is based on the model or manufacturer details this data is pre-populated in MSATS on submission of a particular characteristic, i.e. Inverter Manufacturer/Model Number. However, recommends that fields related to the AS4777 standards be provided as discrete inputs as it simplifies the current and any potential future system changes required	The current collection framework supports calling upon existing databases for auto-population and allowing DNSPs to establish default DER installation data for self-defined classes of installations.
36	Clean Energy Council		We acknowledge and welcome AEMO's interest in utilising data held by the CEC, in the interests of avoiding duplication and reducing the administrative burden on installers. The process to utilise existing data collection by the Clean Energy Regulator (CER) is not adequately considered in the Issues Paper. We would encourage AEMO demonstrate how it intends to leverage off the success of the CER and integrate it into the NSP and AEMO data collection processes	Noted. See section 4.3.2 for further details. See section 4.1.2 for details.

No.	Consulted person	Category	Issue	AEMO response
37	Clean Energy Council		AEMO has not given enough consideration to working with manufacturers to obtain data. Data provision by product manufacturers could replace most, if not all, of the data that might otherwise be required from an installer. Most inverter manufacturers now have cloud-based platforms and could provide AEMO with extensive and detailed data on their cloud-enabled fleet. AEMO should allow eligible cloud enabled inverters to be exempt from the requirement for installer-based data collection if the manufacturer has agreement with customers and AEMO to provide the data required for the DER Register. Inverters with the capability of remote data acquisition render AEMO's proposed manual data collection process obsolete.	AEMO agrees that data provision and auto-population form existing datasets, which may include data from product manufacturers, will enhance data collection efficiency. In regards, to remote data acquisition and changes to inverter settings. The role of the DER Register is to associate DER installation data with market systems (such as NMI). Appendix F indicates that access to accredited third parties via an API may enable remote data acquisition in the future.
38	Energy Queensland		These data variables should be set to default values where possible, with the facility for values to be overridden by installers when relevant.	Noted. See section 4.3 for details.
39	Endeavour Energy		Believe having discrete inputs would be useful for clarity and whilst the use of default settings may make manual input into the system easier, this approach does increase the risk that data is entered without the care required.	Noted. See section 4.3 for details.
40	FormBay		Recommend the ability to input custom values [as well as discrete/ auto populated values] as well for unique circumstances, e.g. the user should be shown the default prescribed values but have the option to over-ride them if the situation requires it.	Noted. AEMO will consider this in the collection process design, noting that FormBay have representation in Delivery Team 2, which focuses on process design.
41	FormBay		Should have a 'swap' solution in place for solar products like panels and inverters (i.e. take data regarding panels and inverters from manufacturer data in first instance where available, but if the product provider is a new entrant into the Australian market and isn't connected with any data source yet, we take 'second best' data from the CEC approved lists.	Noted. AEMO will consider this in the collection process design, noting that FormBay have representation in Delivery Team 2, which focuses on process design.
42	SA Power Networks		Data should be where possible auto-filled from standard sources like Australian standards and the CEC. DER responses should be derived where possible rather than relying on installers to accurately complete tedious data.	AEMO agrees. See section 4.3 for details.
43	SA Power Networks		The current data structure is focused on inverter-based systems and it is unclear how some details of non-inverter-based systems will be captured.	AEMO notes this risk and will consider this in the collection process design.

No.	Consulted person	Category	Issue	AEMO response
44	SA Power Networks		AEMO should use a Common Interface Model (CIM) based on international standards to define data types, formats, and units.	Noted. AEMO will consider this in the collection process design.
45	SA Power Networks		Recommends using default values prescribed by relevant standards. Default values both reduces the data volume and erroneousness. There should be a mechanism to provide discrete inputs if they deviate from the standard settings.	Noted. See section 4.3 for details.
46	Tesla		Inverter demand response modes should be pulled from the CEC approved inverter product list rather than individually provided for each install. The risk of installers providing incorrect information for these response modes is high.	Note these have been removed in the current data model. See section 4.9.1 for details.
47	Tesla		Inverter power quality response modes should be specified by the NSP or drawn from the CEC approved product list	Noted. See section 4.3 for details.
48	Tesla		Voltage/ frequency protections – as above, this information will be static at the jurisdictional level and should be provided by the NSP.	Noted. See section 4.3 for details.
49	Redback Technologies		AEMO's process assumes a pre-population of fields regarding make/model of devices. It is our understanding that this will be sourced by AEMO from existing data held by the Clean Energy Regulator, but how this data is included in pre-populated fields is not clear in the process outlined.	Noted. See section 4.3 for details.
50	Endeavour Energy	Submission frequency	Input of DER data should aim to be as close as possible to real time with DERID generation following NSP approval of a connection application, thus allowing installers access to install and register information as part of the DER commissioning process.	Noted. See section 4.4 for details.
51	SA Power Networks		Suggest monthly DER Register submissions by NSPs to balance both early and late information provided to SA Power Networks. SA Power Networks will need to perform data cleansing activities which will benefit from monthly submission of data.	Noted. See section 4.4 for details.
52	Ausgrid	Submission format and storage	Supports the approach of leveraging the existing MSATS processes wherever possible; however, we would require further clarity on the data collection and submission framework to understand whether existing MSATS data exchange protocols would need to be augmented. Does not currently have a preferred process for accessing the DER register information without further clarity around the final data collection, submission and validation framework for the DER register.	Noted. AEMO is pursuing a DER register framework that does not reside in MSATS. More information on the data collection framework are available in section 4.1. Additional information on the submission framework is yet to be released. See section 4.5.3 for details.

No.	Consulted person	Category	Issue	AEMO response
53	Ausgrid		Has not yet considered in detail whether we support the addition of an API for submission and change requests.	Noted.
54	Citipower Powercor United Energy		Supports the use of a CATS transaction and storing of the data in MSATS.	Noted. AEMO is pursuing a DER register framework that does not reside in MSATS.
55	Energy Queensland		Supports the suggested format and method of data provision and considers that leveraging the existing MSATS web portal for data transfer is a logical solution. Would also support the investigation of alternative arrangements for the submission of DER information.	Noted. AEMO is pursuing submission to the DER Register via an API.
56	Energy Queensland		Use of an API is appropriate and that it would provide useful functionality	AEMO agrees. This is the approach that we are pursuing. See section 4.5.
57	FormBay		The provision of APIs by NSPs or an expanded, single standard API issued by AEMO directly would more easily facilitate the transmission of information from installation site to the DER register.	AEMO agrees. This is the approach that we are pursuing. See section 4.5.
58	Red and Lumo Energy Energy Australia		Concern in relation to schema upgrades that may be imposed on market participants for existing market participants.	AEMO is pursuing a storage option other than MSATS, as such MSATS schema changes that may affect market participants are no longer material. See section 4.5 for more details.
59	SA Power Networks		Do not support the proposed method. DER information is not held within our National Market Systems that interact with MSATS. Significant investment would be required by SA Power Networks to align with the proposed method. Strongly prefers a solution that is not linked to MSATS and prefers the concept of interfacing data with AEMO via an API outside of MSATS.	Noted. AEMO is pursuing a DER register framework that does not reside in MSATS.
60	Ausgrid	Integration of DSP and DER generation	Potential risks in the different submission frequencies of the DER Generation information and DSP information particularly where there is cross-over between the two data sources and conflicting information between the two data sets. A more regular update of DSP information might be worth exploring (for example 6 months).	Noted. See section 4.6 for details.

No.	Consulted person	Category	Issue	AEMO response
61	AusNet Services	information - ffrequency	There is a risk that data could become misaligned as the year progresses, however there is no impact for this risk to NSPs as this information is held up to date at all times as part of our existing obligations and updated for operational purposes.	Noted. See section 4.6 for details.
62	Citipower Powercor United Energy		Have not identified any risks with different submission frequencies.	Noted.
63	Endeavour Energy		Have not identified any material risks that may arise from collecting DSP information less frequently (annually) than DER information (ongoing).	Noted.
64	Red and Lumo Energy		If information would be visible and accessible to all market participants via NMI Discovery, be applied retrospectively to all existing sites (not just applicable to new) then we are supportive of the on-going frequency proposed to DER generation information.	DER Register Information access to all market participants is not currently provisioned under the NER.
65	Tesla		It is unclear why different processes and timelines are needed for DER and DSP information.	Noted. See section 4.6 for details.
66	Ausgrid	Integration of DSP and DER generation information – storage	In principle, if the DER register information is accessible and easy to use, Ausgrid does not foresee any significant issues as to whether the information is stored in the DSP information database or the DER Generation information database.	Noted. See section 4.6 for details.
67	AusNet Services		Separate storage of DSP information and DER register generation creates the issue of alignment, and unclear responsibilities of resolving data quality issues. An alternative approach is superseding DSPI requirements (for DNSP requirements only) with that of the DER register, as between DER register and MSATS the information requirements can already be met.	Noted. An explanation on the alignment of DSP information and the DER Register is in section 4.6.2. AEMO notes the future potential for future integration of DSP and DER Register in section 4.6.3.
68	Citipower Powercor United Energy		Supports the separate storage of the DER and DSP information.	Noted.
69	Energy Queensland		Due to the overlapping nature of some DSP and DER generation information, there is some risk of data inconsistency. Energy Queensland is working to ensure we have a 'single source of truth' for both sets of data to reduce the potential for inconsistency. Note the potential for the duplication of this information and discrepancies in the database.	Noted. See section 4.6.2 for details.

No.	Consulted person	Category	Issue	AEMO response
70	FormBay		We do not see any issues with the separate storage of DSP information and DER generation information.	Noted.
71	Red and Lumo		AEMO has already developed and implemented similar platforms for supporting the submission of related data through the Demand Side Participation Information portal (DSIP). We fail to see any benefit in keeping these processes separate.	Noted.
72	Tesla		The DER Register should aim to capture all assets capable of controlling MWh (either generation, demand reduction or bidirectional energy flows) which would capture DER and DR assets.	Noted. AEMO is exploring the benefit of combining the DSP and DER guidelines and databases in a future iteration of the Register.
73	Ausgrid	Data Access	Strongly support the development of processes and systems to enable DNSPs to access DSP information collected by AEMO from other registered participants for activities occurring in its service area.	Noted. AEMO will progress this through the Demand Side Participation collection process.
74	Ausgrid		An API for developing custom reports may be useful but Ausgrid is not yet in a position to comment in detail without further clarity around the final data collection, submission and validation framework. A NMI discovery process (including DER) would be useful.	Noted. See section 4.4 for details.
75	AusNet Services		DNSPs should have this information already, so access to the DER register information does not provide a clear benefit over existing processes. DNSPs will require reports and interfaces to view DER register information held in AEMO's systems	Noted.
76	AusNet Services		Support the establishment of API that allows registered participants to report on DER register information and all other relevant information in MSATS.	Noted. See section 4.4 for details.
77	Citipower Powercor United Energy		Prefer to use an API to develop custom reports. Do not believe the NMI discovery process would be useful as this only gives a view of 1 NMI at a time. Do not see a need for C1, C4 and C7 reports to be provided if an API is provided.	Noted. See section 4.4 for details.

No.	Consulted person	Category	Issue	AEMO response
78	Endeavour Energy		Support access via an API which would allow for fully customised reports to be developed, rather than being reliant upon centralised standard reports. Where there is a common need across users including aggregated data for NSPs, a library of pre-existing reports would be ideal. Where there are specific requirements an opportunity to build upon the existing report library should be available.	Noted. See section 4.4 for details.
79	Endeavour Energy		NMI discovery is useful and should be provided for accessing valid NMI address information and registered data. particularly for installers on behalf of a customer so they are aware of the approved connections and configurations of any existing systems. We consider the C1, C4 and C7 reports to be more transactional based on real time and will require them as per existing schedules.	Noted. AEMO is considering the extent to which some data can be made available to installers. The Draft Information Collection Framework currently does not rely on address as an identifier for the DER installation site. See section 4.4 and Appendix F for details.
80	Endeavour Energy		Seek to confirm the register can be accessed at any time by NSPs at no cost.	AEMO will provide DER Register access to NSPs under NER3.7E(n) at no cost.
81	Energy Queensland		Considers this use of an API is appropriate and that it would provide useful functionality.	Noted. See Section 4.4 for details.
82	Energy Australia Origin Energy Red and Lumo		Request clarity regarding whether retailers will be permitted access to DER Register information.	Retailer access is not currently provisioned under the NER.
83	FormBay		The 'access' model for DER information should, typically, be a 'verification approach', i.e. a relevant external party submits data they already have and receives a true/false response back instead of submitting an open query for all information on the register.	Noted. AEMO will consider this in the collection process design as outlined in Appendix F.
84	FormBay		We would recommend any access be via API to allow various stakeholders to create their own methods to access register information, subject to AEMO controls and oversight.	Noted. See Section 4.7 for details.

No.	Consulted person	Category	Issue	AEMO response
85	FormBay		Recommendation to consider changes around 'Special Participant' Category in Chapter 2 of the NER to support access to this data by external consulting firms and software firms when these entities are contracted by another market participant to carry out work on their behalf.	The Special Participant category relates to system operation that is delegated to an agent. It is not appropriate to extend this participant category for the purpose of data access. Appropriate data access provisions are being considered in further engagement with Delivery Team 2, which AEMO understands FormBay has representation in.
86	Red and Lumo		Majority of market participants have not adopted API. AEMO needs to consider the implications this may have to some participants.	AEMO also notes that the DER Register access requirements are currently open to NSPs only. All NSP submissions supported API development for access to the DER Register.
87	SA Power Networks		Prefer to access data via the same API interface that is used to post data.	Noted.
88	University of Sydney Law School	Emergency Services access	There seems to be a lack of consideration about the provision and use of this data for emergency planning/first responders, industry groups, energy consumer advocates and for academic researchers. Please consider giving better access to these groups – either as of right or upon a formal application process.	The DER register report is being designed to provide access and information on DER to the public, including industry groups, energy consumer advocates and researchers. AEMO has made best endeavours to engage Emergency Services groups on their need and access to the register, however have had no engagement/ response, making tailoring a solution to meet their needs challenging.
89	Ausgrid	Data content– specific fields	Recording the details of the installer that is the data source provider will also be important to enable a compliance or audit process or system to be implemented more effectively.	Response provided in section 4.9.1.
90	Citipower Powercor United Energy		Should consider the integration of remote monitoring of invertors as a future state requirement.	Noted.

No.	Consulted person	Category	Issue	AEMO response
91	FormBay		Suggested adding new variable: Expected (approximate) degradation dates (for Solar PV panels). Taking into account these approximate values might allow forecasting to be more accurate over time.	Response provided in section 4.9.1.
92	FormBay		Recommend the capture of photographic evidence of the installation and serial numbers of the products – noting that one requirement of the register is the provision of data to Emergency Services personnel.	Response provided in section 4.9.1.
93	Energy Queensland		Recommends that 'Energy Source Capacity' be a defined field in any reporting from the DER register due to its value in reporting and modelling.	Response provided in section 4.9.1.
94	Energy Queensland		Suggestion fields: Panel Direction. Has a significant impact on the relative output of the panels. A consideration of inclusion of this attribute is recommended due to its impact on DER output at different times of day. Panel Tilt. Affects DER output, but EQ considers the variables too great to warrant collection.	Response provided in section 4.9.1.
95	Energy Queensland		Inclusion of "Decommissioned systems". This would ensure we were aware in most cases when a DER installation is removed or has failed with no owner intention to recommission.	Response provided in section 4.9.1.
96	Energy Queensland		Removal of "Inactive" requirements in "Status" at DER Device level, and ideally "AC Connection" and "DER Device" levels.	Response provided in section 4.9.1.
97	Energy Queensland		Greater clarity is needed around 'data source/providers' in the table, potentially via two columns: one headed 'Data source' and another headed 'Data provider to Register', as these are often different entities.	Response provided in section 4.9.1.
98	Energy Queensland		As many of the devices on the register are going to be at single- or two-phase residences there would be some interest in knowing whether the NMI associated with the premises is a single- or two-phase NMI or if the DER is connected to one or two phases but is at a three-phase premises. This detail would be valuable for DNSPs to determine network loading/efficiency at a MV/substation level, especially with high levels of aggregated DER.	Response provided in section 4.9.1.
99	Energy Queensland		Device sup-type: Notes the value of device sub-type information, e.g. battery chemistry, for emergency services, however, question the relevance of collecting data on panel type as the variation in generation output per kilowatt (kW) of rated capacity over the life of the panels in minimal.	Response provided in section 4.9.1.

No.	Consulted person	Category	Issue	AEMO response
100	Energy Queensland		Recommends that the term 'Region' be clarified.	AEMO intends that the term Region has the definition given to it under the NER.
101	Energy Queensland		As very few inverters have been installed with Demand Response Enabled Devices, and implementation of Demand Response Mode '0'(DRM0) is not specified in any connection standards, Energy Queensland recommends that a 'Null' option be added to the proposed multi -select options, and that 'Null' be set as the default value	Response provided in section 4.9.1.
102	Energy Queensland		The fields of 'Inverter device capacity' and 'Export limit' are stated kW. Energex and Ergon Energy Network currently record this information in kVA for values up to 30 kVA, an approach which aligns with the Clean Energy Council's publication of AS/NZS 4777- compliant inverters. We suggest that AEMO consider this alternative parameter for the DER Register.	Response provided in section 4.9.1.
103	Endeavour Energy		Suggest adding total generating capacity, total energy storage capacity and VoltVar/Watt limits to level 2 data. These would provide verification of installer compliance to connection requirements.	Response provided in section 4.9.1.
104	SA Power Networks		Additional field suggested to vet and qualify the quality of data. Confidence flags that indicate level of confidence in the data and the source A flag to indicate whether a DER device is under feed in management control by a NSP.	Response provided in section 4.9.1.
105	SA Power Networks		It is not completely understood how the date system works in the data structure, but it should be able to consider systems being operational at different dates from the submission date.	Agreed, AEMO is proposing to align to the DER Register data model to the MSATS structure. The status fields included in the data table record date details of status change, with a history available.
106	Ausgrid	Data content – non-inverter technologies	Data requirements need some further consultation and refinement particularly around non-inverter generation system treatment. There are also some advantages to adding in aggregate information fields to the level 2 data model including total inverter, generator and storage capacity.	Noted. AEMO welcomes stakeholder feedback on this matter and will continue to refine this with stakeholders through Delivery Team 1.

No.	Consulted person	Category	Issue	AEMO response
107	Ausgrid		Non-inverter type of information may be better as an attribute in the level 2 DER Installation table for example. However, there are also examples where the non-inverter generation information may fit within the level 3 and 4 tables.	Noted, AEMO will consider this in design of the final data model. AEMO welcomes stakeholder feedback on this matter and will continue to refine this with stakeholders through Delivery Team 1.
108	AusNet Services		Non-inverter DER must abide with more stringent protection requirements, however it is not appropriate to characterise these modes with AS4777 functionality.	Noted.
109	Citipower Powercor United Energy		Relevant to include protection modes for non-inverter DER … should include: ROCOF, anti-island, inter trip scheme, export limiter/prevention, volt/var control and power factor control.	Response provided in section 4.9.1.
110	Citipower Powercor United Energy		Agrees with all variables except the 'Non-inverter generator – voltage/reactive power regulation' Data Model Level 3 – AC Connection as we don't collect this information.	Noted. AEMO is still in the process of refining the non-inverter information in the data model and welcomes further stakeholder engagement on this matter.
111	Energy Queensland		Non-inverter generators: EQ only specifies generator ramp rate and frequency response mode for registered generators so questions whether these parameters are in scope of the DER Register.	Noted. AEMO is still in the process of refining the non-inverter information in the data model. AEMO welcomes stakeholder feedback on this matter and will continue to refine this with stakeholders through Delivery Team 1.
112	Energy Queensland		That there are challenges for including protection settings for inverter-based technologies due to the lack of legislative requirements for compliance to these settings. The ENA National DER Connection Guidelines are intended to bring greater alignment in this space. However, the ENA guidelines do not mention the frequency limits beyond which inverters will stop operating (Fstop) or stop charging (Fstop-CH). Energy Queensland considers that there may be benefit in AEMO consulting further with the ENA to foster national alignment on this as a requirement.	Noted. AEMO is still in the process of refining the non-inverter information in the data model. AEMO welcomes stakeholder feedback on this matter and will continue to refine this with stakeholders through Delivery Team 1.
113	Endeavour Energy		Consideration should be given for the incorporation of non-inverter DER data into level 2 as NSPs would specify these parameters at application.	Noted. AEMO is still in the process of refining the non-inverter information in the data model and welcomes further stakeholder engagement on this matter.

No.	Consulted person	Category	Issue	AEMO response
114	Ausgrid	Data content general	Recommends that more detailed information on the forecasting assumptions is reported by AEMO. This might include information on how the historical information is used to determine any forecast trend used in the forecasting model. This is to ensure that the use of the DER information is transparent to other market participants.	AEMO has on obligation to report annually on how the data has been used to influence forecasts. AEMO publishes several reports that address the forecasting of load. At least once a year, in one or more of those reports, AEMO will include a discussion on the extent to which DER generation information informed AEMO's *load* forecasts.
115	Ausgrid		Another example we would like to see included is an upgrade example where a site has an existing solar PV system (DERID1), and where a customer/ installer adds a second Solar PV system (DERID2) and a battery system with a separate inverter (DERID3). In this case it could be treated as three separate DERIDs at the same NMI or potentially as a single DERID with three different ACConnectionIDs.	As the data model has been updated to a three-level model, this use case can not only be considered as a single DER Installation (NMI) with three different ACconnectionIDs.
116	AusNet Services		We seek justification on why AEMO requires each of these fields.	Justification on the use of the data fields was included in the data table that was presented in the Issues Paper. AEMO request stakeholders to detail any additional fields that require justification.
117	Citipower Powercor United Energy		The Export Limit field it states, 'Exceeding this limit will require the installation to disconnect'. Can you please confirm which jurisdictional instrument supports this?	The Export Limit field is only to capture the threshold applied by the relevant DNSP. The data model will remove this statement.
118	Citipower Powercor United Energy		If there is an amendment to an existing DER, for example a customer expands the installed solar capacity from 3kW to 5kW. Will we be expected to provide a change request with an updated export limit of 5kW or an increase of 2kW. CitiPower Powercor recommends that the new export limit rather than the increment is provided.	If a customer modifies their installation such that the export capacity is changed, the export limit in the DER Register should also be updated.
119	Energy Queensland		Considers that the number and nature of proposed fields for the DER Register creates an onerous administrative burden on DNSPs and installers in particular.	Noted. See section 4.3 and 4.9.1 for details.

No.	Consulted person	Category	Issue	AEMO response
120	Energy Queensland		Considers that AEMO may have misinterpreted the application of central protection values under AS/NZS 4777.1:2016 in the DER Register Information Guidelines. Centralised protection does not apply to the majority of inverter connections less than 30MW. These only apply to connections sized between 30 kVA and 200 kVA (see Table 1 of AS/NZS 4777.1), and some between 200 kW and 30 MW where individual Inverter Energy System (IES) installations are between 30 kVA and 200 kVA. These central protection settings will be programmed into a separate protection device discrete from the inverter. Further, AS/NZS 4777.2 applies to all LV grid connected inverters, whereas AS/NZS 4777.1 only applies to installations of IES up to 200 kVA. We also note that for each example provided the protection and voltage 'example data' were incorrect (with the exception of what AEMO refer to as "Overvoltage Protection 1 (V>>)" which should actually be "Overvoltage Protection 2 (V>>)" which is an internal factory setting for the inverter aligned to AS/NZS 4777.2. We also note that for the first four examples cited in Appendix C, all of the aggregate inverter sizes were too small to require the installer to install central protection.	Noted. See section 4.9.1 and updated examples in the data model presented in the Draft DER Guidelines.
121	SA Power Networks		Careful consideration should be taken to the volume and necessity for such large and detailed data requirements.	Noted. See section 4.3 and 4.9.1 for details.
122	AusNet Services	Data content – data model structure	Option B included in the minutes of the DNSP DER Register workshop is preferable as data is maintained on the acquisition, upgrade or removal of DER devices and is in line with what DNSPs and RECs may have reasonable visibility over without imposing invasive measures on the customer to recover the backlog of relationship data.	Noted. See section 4.9 for details.
123	Ausgrid		The existing data models do not include sufficient historical DSP activity to appropriately disaggregate the contribution to resultant spatial demand from customer DSP activity. Absent are the contracted and actual demand reductions and event dates and times by NMI for Data Model Section 2 activity.	Noted. AEMO will consider in the integration of existing datasets and note for further discussion with Delivery Team 3.
124	Ausgrid		Strongly encourage a methodology where a DNSP issues a DERID at the time of approval of a connection application according to an AEMO allocation procedure.	The updated data model excludes the DERID identifier. See section 4.9 for details.
125	Ausgrid		The DERID could contain the NMI as a component of the DERID to make identification and matching more efficient.	The updated data model excludes the DERID identifier. See section 4.9 for details.

No.	Consulted person	Category	Issue	AEMO response
126	Citipower Powercor United Energy		Seeks clarification how unique identifiers will be provided or accessed by the NSP? Recommends that these unique identifiers be created and provided to AEMO by the NSP when they create, modify or decommission DER information in their systems.	The updated data model excludes the DERID identifier. See section 4.9 for details.
127	Endeavour Energy		Agree with the proposed data structure.	Noted.
128	Energy Queensland		Propose for consideration that the DERID have a DNSP prefix and be numerically assigned by the DNSP in its source system.	The updated data model excludes the DERID identifier. See section 4.9 for details.
129	Energy Queensland		Generally agrees with the proposed data structure, however considers there to be very limited benefit to its DNSPs in having access to data defining configurations below the DER Installation level.	Noted.
130	SA Power Networks		Unclear to SAPN the purpose of level 2 in the data structure (i.e. DER installation level).	Noted. See updated data model in section 4.9.6.
131	Tesla		Separating DER device requirements from AC Connection data requirements (level 3) is going to cause confusion where devices are fully integrated (such as a BESS with an integrated inverter). The data model needs to avoid duplication of the same device level information being provided twice.	This can be managed by having a 1-1 relationship between the AC Connection (Inverter) and battery. Perhaps a flag to indicate this arrangement could be included.
132	Tesla		Unclear of the benefit of assigning a DERID to each installed asset. There is a risk that where multiple assets are reported for a single NMI these are treated as cumulative for the purposes of AEMO planning. The critical piece of information is the export capacity at the NMI.	The updated data model excludes the DERID identifier. See section 4.9 for details.
133	AusNet Services		Aggregation reports at the post code level are of no benefit for NSPs.	Noted. Data access arrangements for NSPs are detailed in section 4.6.

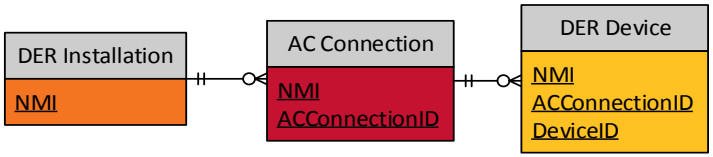
No.	Consulted person	Category	Issue	AEMO response
134	Citipower Powercor United Energy Energy Australia Energy Queensland Endeavour Energy Tesla Ausgrid	DER Register Report - Aggregation	Supportive of aggregation at a post code level for public reporting.	Noted.
135	Energy Australia		Recommend aggregation of capacity at the transformer or feeder level. This will enable retailers to identify opportunities to help customers and the network better.	See section 4.10 for information.
136	FormBay		Aggregation at post code level should provide sufficient information to start with. We would also recommend consideration around aggregation at a street level, as this information would allow NSPs to consider network impacts on a street by street basis.	Noted. NSPs will be able to access all DER data for their network. AEMO is considering aggregation options that protect personal information and comply with AEMO's obligations with respect to protected information under the National Electricity Laws.
137	Ausgrid	DER Register Report - Frequency	Monthly updating would appear to be appropriate for most purposes.	Noted.
138	Energy Queensland		Energy Queensland considers that reporting DER information by AEMO on a monthly basis is appropriate for public reporting.	Noted. See section 4.10 for details.
139	FormBay		Monthly is a suitable schedule for modelling or market analysis.	Noted. See section 4.10 for details.
140	SA Power Networks		Monthly Publishing aligns with SA Power Networks preferred frequency of publishing data.	Noted. See section 4.10 for details.
141	Ausgrid	DER Register Report - Content	AEMO should also publish aggregate information about how much DSP is active within different regions and the types of DSP, scale in MW and potentially class of market participant depending on confidentiality considerations.	AEMO notes this request. See section 4.10 for details. Further details on the alignment of DSP information and DER generation information is available in section 4.6.

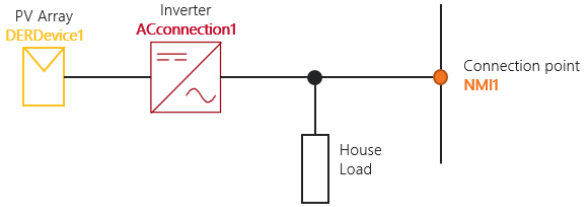
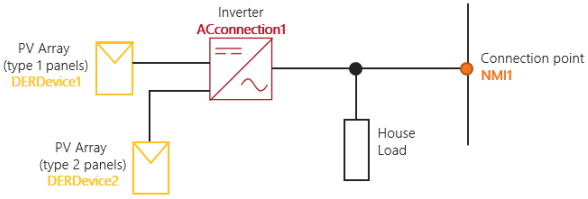
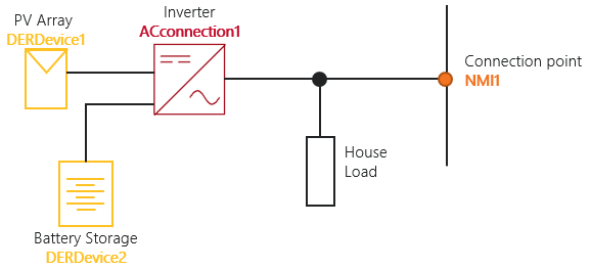
No.	Consulted person	Category	Issue	AEMO response
142	Energy Queensland		Energy Queensland notes that if DER is being filtered by fuel type, but then aggregated by postcode and shown as 'Null' if no more than 10 in that postcode region, many unique projects may not show on the register reporting at all e.g. Hydro, biomass, geothermal.	Noted. AEMO will publish aggregate information where there are sufficient numbers to ensure protection of personal information and confidential information. AEMO will also publish information aggregated at the regional level (as well as postcode), which will allow information to be presented that may be identifiable at the postcode level. See section 4.10 for details.
143	Endeavour Energy		The selected DER register report variables are appropriate.	Noted.
144	AusNet Services	Privacy	Privacy and confidentiality laws regulate the provision of DER Register information to authorised agents (installers). It is likely that existing site information will need to be provided to the DER installer to contextualise the change so that the correct assets are modified, particularly where DER register data assigns a relationship between devices and connection. If DNSPs maintain connection processes and provide AEMO with DER information, then we have an opportunity to manage these authorised data requests.	Noted. See section 4.11 for details.
145	AusNet Services		We seek to understand AEMO's plans of securing the provision of DER information to authorised agents for the purpose of facilitating DER upgrades/removals and prevent DER data from being exploited by non-authorised parties.	Noted. See section 4.11 and Appendix F for details of the draft Information Collection Framework.
146	Greensync		Data belongs to DER asset owners and must be protected. Asset owners will be reluctant sharing their data unless they understand its value, receive fair recognition and, potentially, remuneration for making it available to other parties and receive assurance that their data will be protected or used appropriately. This means that careful planning will be required to ensure that DER data is protected and that assets owners are able to be appropriately rewarded and recognised for making their data available to energy market participants.	Noted.

No.	Consulted person	Category	Issue	AEMO response
147	Ausgrid	Other	Recommends further consideration into how the recently launched ENA National Connection Guidelines or other relevant international standards around DER can be leveraged as part of this process.	Noted. AEMO will continue to work with the ENA to ensure alignment between Guidelines and leverage efficiencies, where possible.
148	Clean Energy Council		AEMO is already developing an API for use in Virtual Power Plant (VPP) trials. The use of live inverter data lends itself to the development of a dynamic register. This would be a far more useful approach than a static register that relies on manual reporting by installers. The AEMO work on VPP trials should be aligned with the work of the AEMO DER Register.	Noted.
149	Energy Queensland		Notes that the AEMC has ruled that electric vehicles (EVs) and associated charging systems are excluded from the scope of the DER Register. However, we still consider that information on EVs and related charging equipment, including the location and nature of their use, is of significant importance to AEMO and DNSPs and should be captured in a data repository.	Noted.
150	Greensync		Support a cross-industry, collaborative approach to developing the DER Register to harness the views and expertise of a wide range of stakeholders, particularly those who are developing solutions to enable consumers to maximise the value of their DER, and for the DER to be utilised to support the energy system.	Noted.
151	Tesla		In the long-term AEMO is going to get the most value from dynamic information, specifically understanding the aggregate output of a number of assets during a dispatch period.	Agreed. AEMOs DER Register and VPP projects are working together to ensure data consistency between the projects.
152	Tesla		We assume that it's not the intention of the DER Register to capture assets that are registered with AEMO in accordance with Chapter 2 of the NER.	The DER register will contain *DER register information* as defined under the NER. These units, by definition, are not registered under Chapter 2.

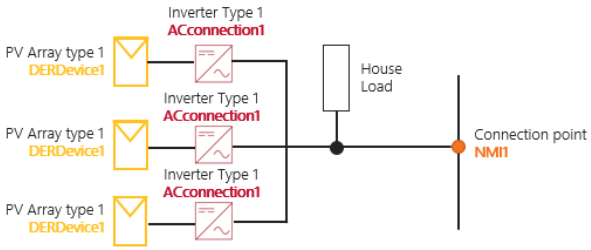
APPENDIX C. DATA MODEL CONFIGURATIONS

The following scenarios are examples of what the current data model (presented in the Draft Distributed Energy Resources Register Information Guidelines) can (✓) and cannot (x) accommodate.



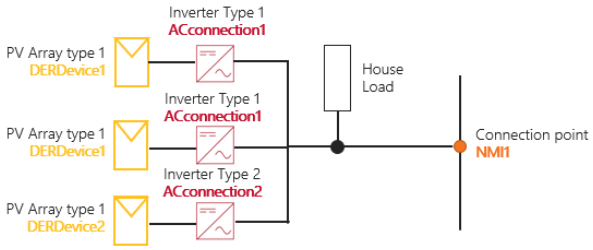
Scenario A	Scenario B	Scenario C
		
✓ 1 PV array, 1 inverter, 1 NMI	✓ 2 different PV technologies, 1 inverter, 1 NMI	✓ Battery module and PV array, 1 inverter, 1 NMI

Scenario D



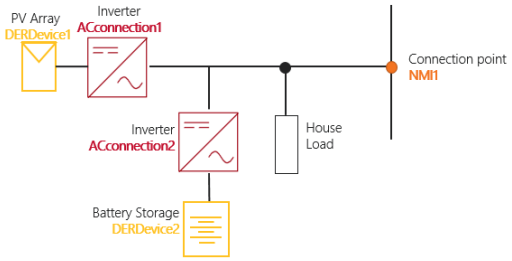
✔ Identical PV arrays, 3 microinverters of the same type (make/ model), 1 NMI

Scenario E



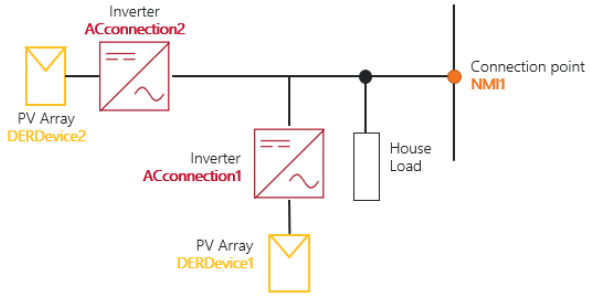
✔ Identical PV arrays, 3 microinverters of different types (make/ model), 1 NMI

Scenario F



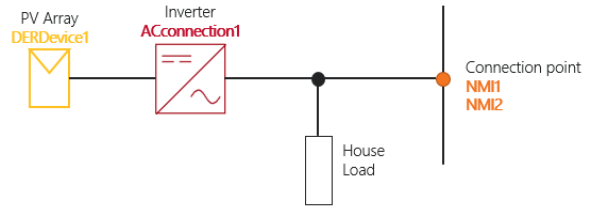
✔ Battery module and PV array attached to separate inverters, 1 NMI

Scenario G



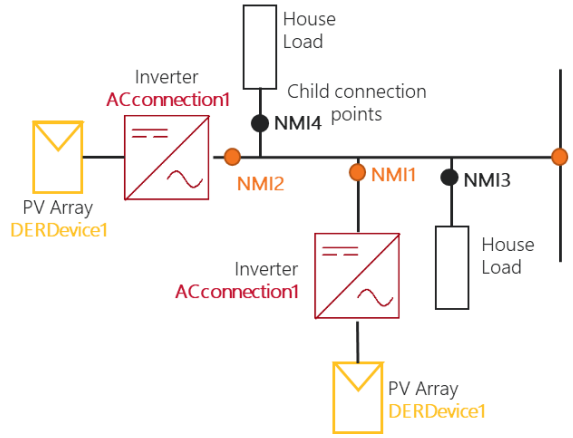
✔ 2 PV arrays attached to separate inverters, 1 NMI

Scenario H

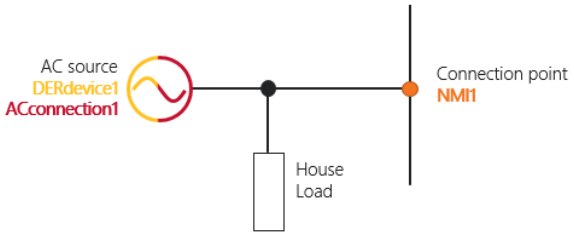
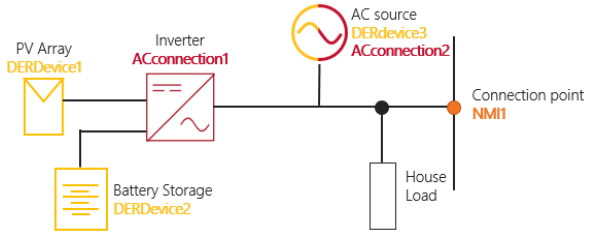
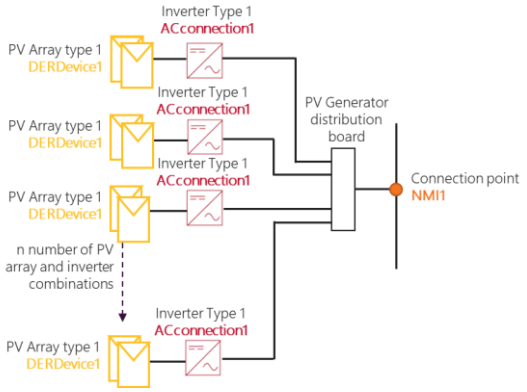


✘ 1 PV array, 1 inverter, 2 NMIs

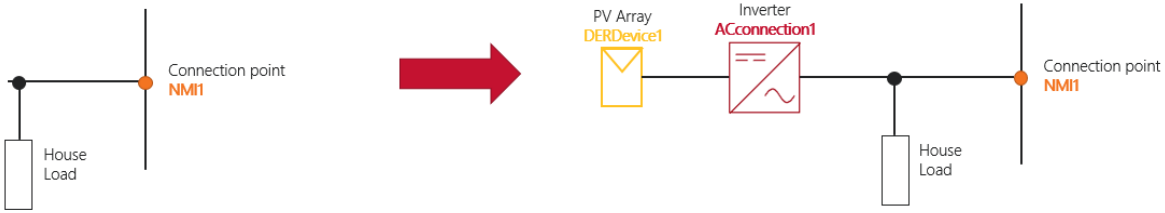
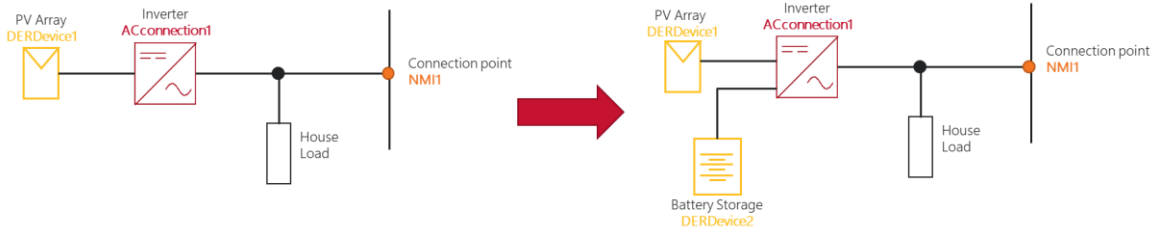
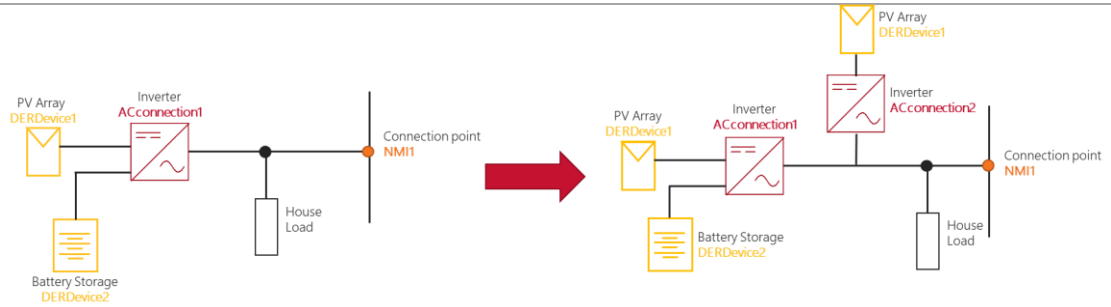
Scenario I

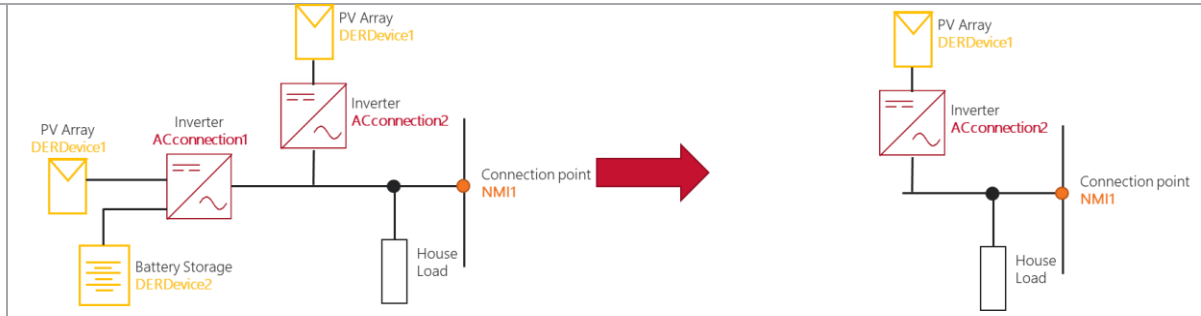
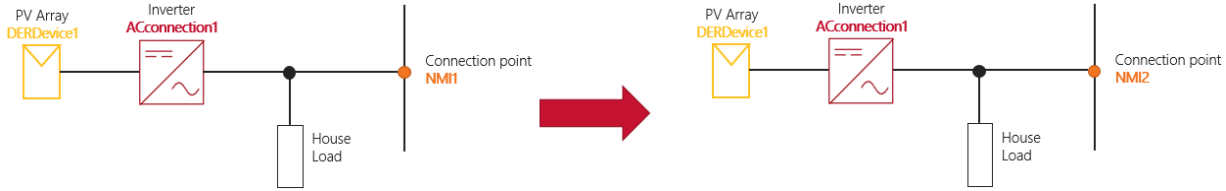
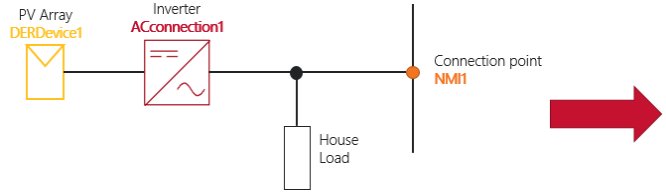


✔ Embedded Network: 2 PV arrays attached to separate inverters, and attached to separate child NMIs, 1 parent NMI

Scenario J	Scenario K	Scenario L
		
✔ 1 AC source, 1 AC connection. 1 NMI	✔ Battery module and PV array connected to 1 inverter, 1 AC source and associated AC connection, 1 NMI	✔ Commercial scale "n" identical Inverters each with "k" PV panels of the same model, 1 NMI with central protection details Total site PV capacity = k*panels capacity

APPENDIX D. USE CASES

Use Case	Initial diagram	Description
New installation		Existing household with no DER installation. The new installation comprises of 1 PV Array (DERDevice1), 1 inverter (ACconnection1) and 1 NMI (NMI1)
Modify installation		An existing DER installation is retrofitted with a battery module to form a DC coupled solar battery system. The make and model of the inverter from state A (ACconnection1) will be changed to match the new inverter. The only change to the NMI will be the details of the connection approval.
Add installation		A new DER installation is added to the NMI. This installation has a separate inverter (ACConnection2) and DER device. A new DER installation is added to the NMI.

Decommission installation		ACconnection1 is decommissioned, including the solar battery system and associated inverter. There is no change to the ACConnection2 or the NMI.
Knock down and replace		The site is knocked down and replaced. A new NMI is established at the site. The ACconnection and DERDevice will be created with respect to the new NMI. The site is knocked down and replaced. A new NMI is established at the site.
NMI extinction		Site is demolished and NMI extinct. DER installation no longer exists.

APPENDIX E. ATTACHMENT 1 – DRAFT DISTRIBUTED ENERGY RESOURCES REGISTER INFORMATION GUIDELINES

The Draft Distributed Energy Resources Information Guidelines can be found at:

https://www.aemo.com.au/Stakeholder-Consultation/Consultations/NEM-Distributed-Energy-Resources-Information-Guidelines-Consultation?Convenor=AEMO%20NEM

APPENDIX F. DRAFT INFORMATION COLLECTION FRAMEWORK

As noted in Sections 4.1 and 4.2 AEMO has been working with stakeholders and technology architects to refine the information collection framework. The key elements of the collection framework are provided here to allow stakeholders the opportunity to comment on detailed aspects as required. AEMO encourages stakeholders to provide further feedback on the draft Collection Framework.

F.1 Assessment of draft Information Collection Framework against DER Register principles

The DER Register Issues Paper outlined the principles AEMO would apply in the development of the DER Register and the associated collection process. These principles were discussed and developed during initial stakeholder engagement in November 2018 and submissions to the Issues Paper did not provide any further comment on them.

Below, AEMO has outlined how the characteristics of the draft Information Collection Framework supports the achievement of these principles:

1. The draft Information Collection process supports that data collected should comprise of the statically configured, physical, DER system, at the time of installation by
   - Creating an avenue for confirmation of as-installed data by the installer.
   - Creating opportunities for application developers to provide services to DER installers that facilitate data submission to the register by installers at the time of installation.
   - Implementing a time-bound process that will apply to ensure DER information is not left in an unsubmitted state.
   - The extent to which DNSPs allow information submitted to the DER register to be edited by installers will be controlled by the DNSP, rather than the DER Register.
2. The draft Information Collection process will have regard to reasonable costs of efficient compliance compared to the likely benefits from the use of DER generation information by
   - Aligning the existing DER connection and installation processes as closely as possible.
   - Allowing DNSP portals interfaces to create default settings based on DNSP preferences such as connection process, technology types and DER capacities.
   - Maximising the efficiency of data collection processes by drawing on existing databases wherever possible.
   - Collecting information that balances both DNSP needs and the DER Register needs and accommodates the varying levels of sophistication across DNSPs in the NEM.
   - Creates an opportunity for post-installation data validation by the DNSP directly (where exceptions are raised) and by other analytical means post submission.
   - Establishing a consistent approach to recording the identity of a DER installer against the DER installation.
3. The draft Information Collection process will support best-practice data collection by
   - Allowing DNSPs to establish default DER installation parameters in line with relevant standards and DNSP-specific installation requirements.
   - Utilising the data sets from the CER as a post-installation validation capability.
   - Drawing on data from the CEC approved product database.
   - Creating an opportunity for application developers to utilise their existing use of product databases and other resources to support installers.
4. The draft Information Collection process will balance information and transparency by being accessible and easy to use, while protecting confidentiality and privacy by

- Embedding 'privacy by design' principles into the collections process, including data access, authentication and verification processes.

– Depending on existing AEMO-DNSP arrangements.

- Creating a DNSP-designated avenue to permit installer access to the DER data for an installation with the NMI and connection application job number, which an installer must be logged into their account to access.
- Ensuring installer accounts are valid and hold the appropriate level of identifying information to manage privacy and confidentiality.

–

F.2 Overview of DER Register functions and user interaction

The following table provides an overview of the practical implementation of the DER Register Information Collection process. It should be read in conjunction with the draft Information Collection Process flow diagram (Appendix F.3).

Task/ Sub-process	Description
Collection of installation information (Task 1.1 – 1.4)	• A customer or third party (usually a customer representative such as a DER installer, electrical contractor, or engineering firm) submits a connection application to the relevant DNSP, which initiates the official process. • The DNSP assesses the connection application and initiates a 'job number' for it. • If the application is accepted, the DNSP prepares a connection offer which identifies any system design parameters and installation constraints. • DNSP enters relevant Data Model Level 1 and associated default data (DNSP-defined) and job number into the DER Register.
Connection applicant engages an installer	• After accepting the connection offer, the connection applicant either engages an independent or affiliated installer or contractor to complete the DER installation, including providing this party with the connection agreement (which holds the job number DNSP-prescribed installation details).
Installer extracts existing site information (Task 1.5, 1.6 and 3.1)	• When an installer has a job to complete, the installer must have established a DER Register account to log in an enter the NMI and job number to access the DER Register. • If the NMI and job number align to the DNSP-entered data, the DER Register will return the relevant DNSP-entered DER installation information and permit editing in the relevant Level 2-3 data fields.
Updating site installation data (Task 1.7)	• The installer should be able to add new installation equipment data in the relevant Level 1-3 fields (e.g. inverters, solar panels, etc) and edit some of the existing data (such as default data designated by the DNSP for Level 2 or 3 fields). However, some fields may be read-only, or require confirmation by the installer (central protection settings, for example). • Existing databases will be used to auto-populate data wherever possible (e.g. based in scanned QR codes at the site the installer would be able to populate data for inverters and solar panels, utilising the existing CEC databases designed for the CER's STC validation).

Task/ Sub-process	Description
Pre-submission data validation (Task 1.7, 1.8, 1.10 and 4.1)	• Once data has been entered into the DER Register the installer the system will indicate whether the data is as expected in regard to the parameters previously defined by the DNSP (and the structure aligns to that expected by the DER Register). Prior to submitting this information, the installer will have an opportunity to either resolve these discrepancies or to confirm that the data they entered is correct. • Where there is a discrepancy, and the installer accepts that the data they entered is correct, this data field is identified with an 'exception flag' for later review by the DNSP.
Data submission (Task 1.9)	• Three potential pathways exist for submission to the DER Register: 1) The data is confirmed by the installer and submitted manually; 2) If the installer has commenced data entry and not completed data entry within 20 days, it is submitted automatically, or; 3) If no account holder has entered the NMI and job number for that DER installation within three months, it is submitted automatically. • Once a submission has been entered into the DER Register the DNSP (i.e. DNSP systems rather than an individual) will receive a notification that alerts them to the submission and describes the nature of any exceptions (e.g. data field discrepancy or a time-out entry as per 2) and 3) above).
Automated post-submission data validation (Task 1.10)	• Once a DER information record has been submitted the DER Register system will have an opportunity to undertake post-submission validation checks. Such checks are intended to reinforce the integrity of the data and alert the DNSP where issues may arise (e.g. device parameter checks against data held in device databases; cross referencing within AEMO systems to identify the meter type at the installation; cross referencing to other databases or sources). • Exceptions are automatically identified and flagged against the relevant data if they arise.
Exception handling (Task 1.10 - 1.13)	• Where exceptions have been flagged at either the pre-submission or post-submission stage this is identified against the DER Register record such that the DNSP's staff can review and address any issues directly in the DER Register, or by contacting the installer to confirm installation parameters.
DER Register storage (Task 1.14)	• Once the submission has passed all checks either automatically, or with exceptions handled and accepted by the DNSP, it will be stored as approved data in the DER Register. • Alerts will be provided to both the NSP's systems and the installers account to confirm that the data has been stored in the DER Register.

Summary of key questoins Key questions for stakeholders on the information collection frameworkdraft Information Collection Framework

AEMO is seeking stakeholder views on specific questions in regardStakeholders are invited to provide views on the draft Information Collection Framework. In conjunction AEMO is seeking stakeholder views on the follow specific aspects:

- Timeframe for submission by installers once they have accessed the information in relation to an installation?
- Timeframe for the data entry to timeout and automatically submit, given it is not accessed by an installer?
- Views from DNSPs on how the designation of data fields as editable or read-only should work. For example, do DNSPs want autonomy over this designation as there are unique circumstances in their network or connection process, or can AEMO designate this in the system design?
- How would DNSPs and installers wish to receive notifications?
- Are there additional post-submission validation checks that would be of value in step 1.11?

F.3 Overview of DER Register Draft Collection Process flow