Distributed Energy Resources (DER) Visibility and Monitoring
Best Practice Guide

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01.
Introduction

Australia leads the world in the deployment of Distributed Energy Resources (DER), with 21% of premises having installed DER and 220,000 new systems being added each year[1].

At present rates of installation, Australia will have around 45-50% of generation installed behind the meter within ten years.

While this increasing DER penetration is contributing to lower electricity costs for consumers and lower carbon emissions, there are a number of key challenges to this continued growth and deliver value for consumers.

1.1 Context

Increasingly, today's smart energy technologies such as remote monitoring devices and solar and battery inverter systems have built-in capabilities to collect vital data from these many DER installations, and to communicate it in near real-time via the internet.

The key challenges facing the distributed energy industry today are:

1. Equitably and cost effectively increasing the DER hosting capacity of the electricity networks while maintaining grid reliability and benefits for all energy consumers, and

2. Increasing the quality of rooftop solar systems being installed, and hence their safety, longevity and the renewable energy generated.

The key barrier to addressing the first of these challenges, as detailed in recent reports[2] is increased DER operational visibility being made available to industry stakeholders. This lack of data is hampering the efficient transition to a low-cost, high renewable penetration electricity system.

The major challenges from this lack of data will be – or is being – felt most acutely in the low voltage networks. It is these network businesses that are also likely to benefit most from being able to access standardised data and information about newly installed DER.

To support the interests of consumers and the system, a key component will be consistent static and dynamic information, accessible for both consumers and other authorised entities. This Guide establishes such a data set.

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1 APVI Market Analysis, May 2019, APVI
2 Refer to DER Monitoring Best Practise Guide Use Cases V1.1 for references

1.2 Purpose & Objectives

This Guide has been developed to deliver benefits for DER consumers, all electricity consumers, energy regulators, and energy industry participants.

This Guide has two key objectives, with targeted outcomes

Objective	Target outcomes
1. To establish a common static and dynamic (near) real time data set collected for new DER installed behind the meter on the low voltage electricity network.	Provide consistent data required to equitably and cost effectively increase network hosting capacity for DER. Enable regulatory bodies, DNSPs, academics and other parties to procure and combine data from multiple sources to meet their network modelling and visibility needs – subject to appropriate commercial arrangements.
2. To increase confidence in the quality and performance of DER through the provision of this real time system performance data to DER owners and authorised industry entities.	Enables consumers and industry participants have consistent information sources to ensure and evaluate optimal operation and system quality.

1.3 Scope and Application

This Guide will apply to data collection and provision from new grid-connected DER installed in Australian locations, behind the meter according to the National Electricity Rules (NER) that are capable of generation.[3] DER generation information is defined in Chapter 10 of the NER as standing data in relation to a small generating unit. A small generating unit is a generating unit:

- With a nameplate rating less than 30 MW; and

- Which is owned, controlled or operated by a person that AEMO has exempted from the requirement to register as a Generator in respect of that generating unit in accordance with clause 2.2.1(c).

For clarity, this Guide does not require the inclusion of any demand side participation information.

The Technology Provider that provides the monitoring equipment and software assumes the responsibility for the acquisition of the data set and provision of this data set to third parties on commercially negotiated terms. This may be provided directly to the third party or through intermediaries.

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3 Data capture applies to new installations only and will not apply retrospectively to other systems that may exist on the same site.

02.
General Requirements

2.1 General Data Requirements

Both the static data set and the dynamic data set are designed to align with the AEMO DER Register and VPP data specification by using the site NMI and System ID fields (if available) as they can provide unique joining fields for a future integration or data analysis. This integration will simplify the registration for the solar installer, avoid duplication of data, and increase the accuracy and value of the data collected.

Following the convention of the AEMO DER Register, DER generation information is provided in a 3-level database structure, and includes information that is:

- Aggregated at the NMI level to provide total capacity and export capacity for the site

- Aggregated at the AC Connection level, where devices are linked together to form a DER Installation, and can provide separation of device types and technologies

- At a device level, where technical details and capacities of individual devices are recorded.

DER generation information is made available electronically via either Application Programming Interface (API) link with an application or via web interface. Further technical details on the use of the API and web interface will be set out in a technical guide[6].

2.2 Static Data Requirements

The static data is data related to the DER system that does not change or is changed infrequently when changes are made to the system or settings. This static Data Set is the minimum set of data that is required for the purposes of this Guide.

A small number of fields are listed as optional where the data is potentially required only for a particular technology type, or, may not be immediately availa ble at the time of installation.

This static data set may be collected in isolation, however this data collection would ideally support and be aligned with the DER Registration process such that the data is only collected once. This data may also be used to support grid connection applications with the relevant network.

The below table lists the data fields required. The "In DER Register" column indicates if the data is included in the DER Register.

4 https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/DER-program/Pilots-and-Trials
5 https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/DER-program/DER-Register-Implementation
6 The organisations that endorse this Guide aim for this technical guide to be aligned with the AEMO DER Register and VPP data specification and any future standards developed by Open Energy Networks or API Technical Working Group or other relevant body so that the industry has a single common data format protocol.

Table 1. Required Static Data Elements

Required Data Point	Description	Units	Notes	In DER Register
System ID	Unique identifier for each connection point where DER installation is (required since NMI can be restricted PID)	Alpha-numeric	Required for new installations and what is monitored by tech vendor (generated by Tech Vendor)	No
Location	Postcode, statistical area, feeder or address depending on privacy and use	Alpha-numeric	AEMO retrieves this information from NMI	No
System type	Type of DER (solar, battery, ev etc) for each DER	Pick list	Must be able to generate power to be classified as DER. Type is from AEMO VPP definitions	No
Technology Provider	Organisation name of the Technology Provider (company that provides the Data Set)	Alpha-numeric	Alignment with AEMO VPP Data - device manufacturer, device model (hardware), and device control box (third party software etc.)	No
Remote access/ connection	Details of type of monitoring attached to site/DER. Should specify type of comms (if any), and if any remote control is available	Y/N, Type (WiFi, 4G, Ethernet, etc)	Type of comms available, remote control available? Note if not connected by customer choice	No
Approved capacity	Approved small generating unit capacity as agreed with NSP in the connection agreement, expressed in kVA	Numeric (kVA)	Can be distinct or equal to an export limitation	Level 1
Solar Retailer	Solar/DER Retailer company name and ABN	Alpha-numeric	Entity accountable for the installation, modification or removal of the DER. Accredited installer is optional.	Level 1
Site details	Site details and controls contained in DER Register	Alpha-numeric	Eg protective controls, # phases or export limits. (Refer to Appendix 4.3)	Level 1
Commiss-ioning date	The date that the DER installation is commissioned	Date		Level 2

Table 2. Optional Static Data Elements

Optional Data Point	Description	Units	Notes	In DER Register
NMI (optional)	Unique identifier for each connection point where DER installation is. Without NMI checksum	Alpha-numeric	Only required for new installations and what is monitored by tech vendor	Level 1
AC Connection ID (optional)	Unique identifier for each AC Connection or Group in a DER installation	15 digit numeric	Optional or sourced via AEMO generated (Refer to diagrams in Appendix 4.2). Can be same as AEMO Dispatchable Unit Identifier (DUID)	Level 2
Equipment details (optional)	Equipment details contained in DER Register	-	Eg Inverter mode (Refer to Appendix 4.3)	Level 2
Equipment settings (optional)	Equipment settings contained in DER Register	-	Eg Voltage settings (Refer to Appendix 4.3)	Level 2
Device ID (optional)	Unique identifier for a single DER device or a group of DER devices with the same attributes	15 digit numeric	Optional or sourced via AEMO generated	Level 3
Device details (optional)	Device details as contained in DER Register	Alpha-numeric	(Refer to Appendix 4.3)	Level 3

2.3 Dynamic Data Requirements

The dynamic data is data related to the DER system that changes frequently depending on the system and grid operating conditions. This dynamic Data Set supports the purpose of the Guide to address visibility and monitoring of performance. This data set has been established to accord with industry requests and specific applications that deliver benefits to all parties.

This dynamic data set is linked to the static data set by the NMI and AC Connection ID fields.

- All data is collected at 5 minute intervals and made available in (near) real time.

- Site-level data is required to be captured using hardware that is accurate to class 1 (1% variance).

- DER level data is required to be captured using hardware that is accurate to class 4 (4% variance).

Dynamic data elements are split into required and optional elements in the two tables below.

Table 3. Required Dynamic Data Elements

Required Data Point	Description	Units	Notes
Site Gross Load - Active/Reactive power	Total Active/Reactive power consumed by the customer (equals Imported + ∑DER generation – Exported - ∑DER consumed). Per phase is preferred with combined acceptable	kW/kVAr	Max, Min, Average
Site Active/Reactive exported power	Active/Reactive power exported from the site. Per phase is preferred with combined acceptable	kW/kVAr	Max, Min, Average
Site Active/Reactive imported power	Active/Reactive power imported from the grid to the site. Per phase is preferred with combined acceptable	kW/kVAr	Max, Min, Average
DER Generation - Active/Reactive power	Active/Reactive power generated by each DER. Per phase is preferred with combined acceptable	kW/kVAr	Max, Min, Average
DER Consumption - Active/Reactive power	Active/Reactive power consumed/stored by each DER. Per phase is preferred with combined acceptable	kW/kVAr	Max, Min, Average
Site Voltage	AC voltage over the period– measured at meter board. Recommended per phase with 10sec measurement interval	V	Max, Min, Average
Time	Accepted date format are yyyy-MM-ddThh:mm:ss or yyyy-MM-ddThh:mm:ss.sss	UTC	Date and time matched to AEMO VPP data (ISO 8601 format)

Table 4. Optional Dynamic Data Elements

Optional Data Point	Description	Units	Notes
Site Active/Reactive energy imported (optional)	Active/Reactive energy imported to the site. Per phase is preferred with combined acceptable	kWh	Cumulative
Site Active/Reactive energy exported (optional)	Active/Reactive energy exported from the site. Per phase is preferred with combined acceptable	kWh	Cumulative
DER Active/Reactive energy consumed (optional)	Active/Reactive energy consumed by the resource. Per phase is preferred with combined acceptable	kWh	Cumulative
DER Active/Reactive energy generated (optional)	Active/Reactive energy generated by the resource. Per phase is preferred with combined acceptable	kWh	Cumulative
Battery SOC (optional)	Battery state of charge (usable)	Wh	Max, Min, Average
Frequency (optional)	Frequency (10 sec or shorter measurement interval). At least two decimal places	Hz	Max, Min, Average and Instantaneous

2.4 Customer Data Visibility

A combination of the Static and Dynamic Data collected from the customer will be available to the customer though common interfacing, namely via website or mobile application.

All of the Static Data will be available to the customer. Customers will also have access to at least the following Dynamic Data (as defined in Table in section 2.3):

- Site Active energy or power imported

- Site Active energy or power exported

- Site Active energy or power generated = Sum of all DER Active energy generated

- Site Active Gross Load or Site Active energy consumed = Site Active energy generated + Site Active energy imported -Site Active energy exported

- Time

The Dynamic Data will be available in 5 min or shorter intervals and made available in (near) real time. Historical data (where available) will also be available to the customers.

2.5 Data Security and Privacy

Data collected from the system owners or customers' DER will most likely contain personally identifying information (PII). Australian consumer law addresses the collection and storage of PII data. All Technology Providers conforming with this Guide collect and appropriately manage customer data today in accordance with requirements where they operate. All Technology Providers comply with the collection, storage and any use of data to meet customer expectations, all applicable local, state and federal consumer law and privacy regulations.

Consistent with Customer Terms and Conditions, privacy provisions must be addressed in accordance with Australian Privacy Laws.

For the purposes of this Guide, any data management must abide by requirements of the relevant Australian jurisdiction. This includes security of data 'in flight', authentication, authorisation for data provision, access, data storage, use and misuse of the data.

2.6 Customer Terms and Conditions

The collection of data from DER owners must comply with relevant local, state and national legislation. The collection must also incorporate explicit customer consent for it to be collected in the first place and provided to third parties.

This Guide requires that customers are given the option to opt-in to provision of data that provides static and dynamic information (separate to the DER Register data capture).

To address customer consent, a data collection statement from the Technology Provider must be provided seeking consent to the collection of personal information for the purposes of active monitoring. The data collection statement must purposefully comply with the Australian Privacy Principles set out in the Privacy Act 1988. In addition, a Privacy Policy must be available on request. A check box must be ticked to finalise DER data collection by the Technology Provider, the Solar Retailer or the installer on behalf of the customer.

2.7 Exceptions and Non-compliance

This Guide allows exceptions and a level of non-compliance due to an expectation there may be a reason why a particular data set is not being, or cannot be, provided.

Initially, non-compliance can be noted with a valid reason. This includes lack of customer consent or other technical reasons that preclude the provision of the data.

2.8 Communications

Data flows from Technology Providers on behalf of individual sites/DER ("cloud communications") is expected to have high quality, consistent availability at the fleet level. This is important to ensure that sufficient data is available for consumers and industry participants to meet the objectives of this Guide.

Each Technology Provider is responsible for the maintenance of the site to cloud communications and the availability of the cloud for API data services. It is recommended that each Technology Provider maintains an availability of at least 90%, calculated as follows

$$\text{Monthly Availability} = \frac{\text{Average \# 5 Min Periods Reported per Site}}{\text{\# 5 Min Periods in Month}} \, \%$$

Notes:

- A reported period is a period where the data is sent from the site to the Technology Vendor and made available

- In a 30 day month there are 12x24x30 = 8,640 x 5 min periods

- The average # periods reported in the month includes all sites registered (pro-rata or excluded for sites commissioned in that month)

- Excludes any exempt sites

- Will include null or zero values for systems that are not energised

This Guide does not include any individual site communications uptime availability target ("site communications") since individual site communication reliability will vary according to a number of factors which are outside the control of the Technology Provider.

Further technical details on the provision and use of the API and web interface will be set out in a technical guide and harmonised with evolving industry standards. This includes requirements for real time availability, access, protocols, and verification. The specific commercial agreement between the parties would specify any agreed Service Level Agreements (SLAs) and other terms and conditions of the provision of the data.

2.9 Third Party Data Access

For clarity, data collected under this Guide is controlled by the Technology Provider and made available commercially to approved data users according to Privacy and Customer Terms and Conditions agreed with the DER owner.

2.10 AEMO DER Register – data alignment

The DER visibility and monitoring data sets proposed in this Guide align with key data fields in the AEMO DER Register and AEMO VPP Data specification. By aligning key data points which are consistent (today), the intent is to ensure that there is potential for a future integration pathway or data provision pathway for the AEMO DER Register, VPP data specification and other yet to be established standards in Australia.

2.11 Compliance with the law

This Guide co-exists with relevant state or federal legislation, including Australian Consumer Law (Cth) (ACL) (Schedule 2 of the Competition and Consumer Act 2010). These laws are not replaced or restricted by this guide. This Guide applies to the extent that it is consistent with all existing state and federal legislation and regulation. Where the Guide is found to be inconsistent with any existing state or federal legislation or regulation, that regulatory obligation will take precedence to the extent of the inconsistency. Compliance with this Guide does not guarantee compliance with any legislation.

3.
Governance

3.1 Product Conformance

This Guide is a voluntary guide. A Technology Provider may elect to have some or all of their products conform with this Guide. Conformance is determined by self-assessment by the Technology Provider. This requires:

- Stating the equipment collects the required data fields (or will within 6 months)

- Being listed as conforming on the Guide website www.DERmonitoring.guide.

This may be done by providing the equipment information and a conformance statement to the Guide administrator admin@DERmonitoring.guide.

Complaints against a Technology Provider who has publicly stated that they endorse or conform with this Guide are handled by through normal industry avenues.

3.2 Administration

This Guide has been developed by a leading group of Technology Providers in consultation with energy regulators, DNSPs, academic institutions, consumer and industry organisations. These Technology Providers include Edge Electrons, Enphase, Fronius, GreenSync, Redback, SMA, Solar Analytics, SwitchDIN, Tesla and WattWatchers. These organisations do not automatically endorse or conform with this Guide.

Any enquiries regarding this Guide can be sent to admin@DERmonitoring.guide. Further informatimn is available at www.DERmonitoring.guide.

3.3 Guide Updates

This Guide is intended to be updated based on changes to the operating and regulatory environment of the DER industry. Updates to the Guide can be proposed by contacting admin@DERmonitoring.guide.

The intent of this data set is to ensure the least amount of information is collected to deliver the largest impact. Updates will be assessed according to two key criteria:

- The Technology Provider can cost effectively obtain the data

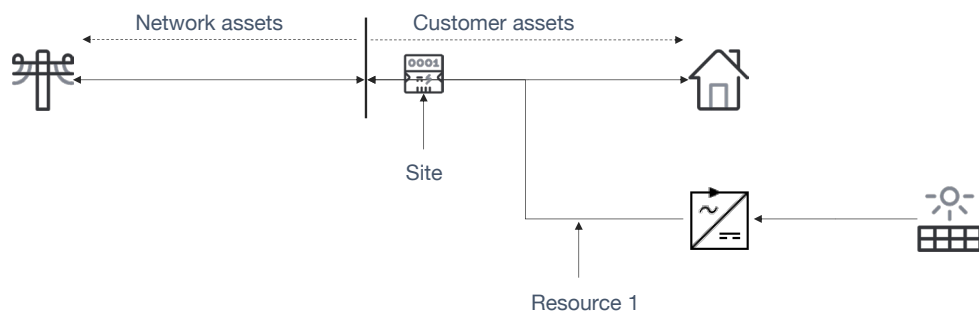- There is clear use-case and value to users of the data
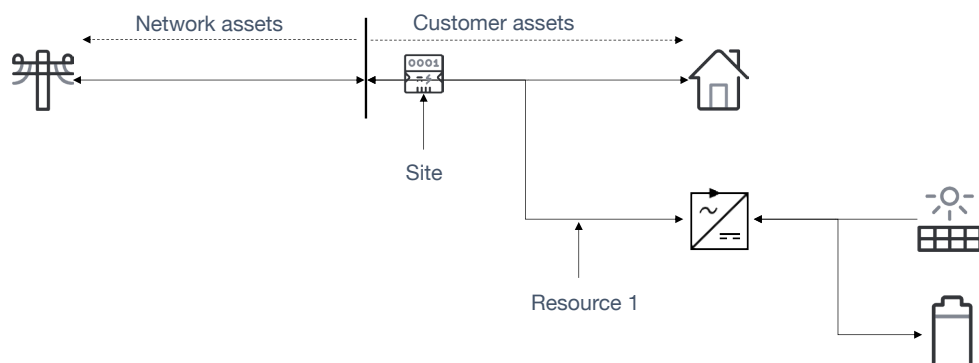
4.
Appendix

4.1 Glossary and Definitions

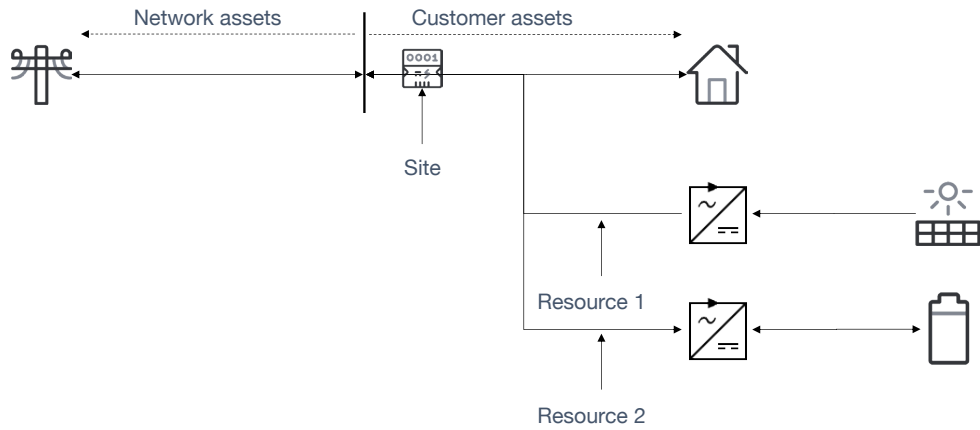|	
API	Application Programming Interface
Data Set	Combination of Static Data Set and Dynamic Data Set
DER	Distributed Energy Resources
DER Owner	Residential or commercial customer who owns one or more DER
Dynamic Data Set	This is a set of data specified in this Guide that is related to the DER system that changes frequently depending on the system and grid operating conditions
DNSP	Distribution Network Services Provider. May also be referred to as Network Services Provider (NSP)
Static Data Set	This is a set of data specified in this Guide that is related to the DER system that does not change or is changed infrequently when changes are made to the system or settings
(Solar) Retailer	Clean Energy Council Approved (Solar) Retailer (authorised by the ACCC) who commits to responsible sales & marketing and industry best practice in the solar and storage industry.
(Solar) Accredited Installer	Clean Energy Council accredited installer that signs the installation form
Technology Provider	Entity that collects the Data Set and makes it commercially available to third parties according to customer terms and conditions and explicit customer consent

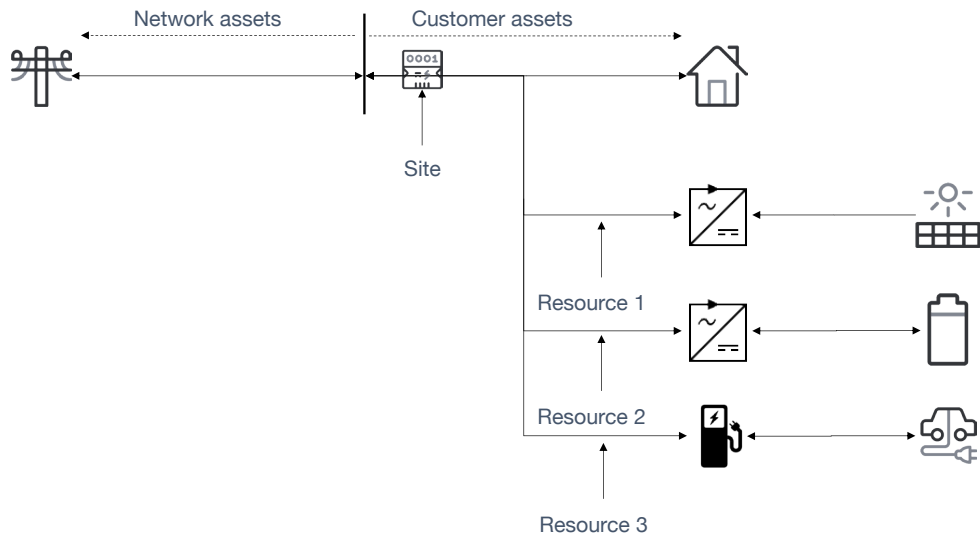## 4.2 DER Monitoring Installation Example Diagrams

Solar only

DC coupled solar and battery

AC coupled solar and battery

Network assets ← → Customer assets

Site

Resource 1

Resource 2

AC coupled solar and battery and EV

Network assets ← → Customer assets

Site

Resource 1

Resource 2

Resource 3

Online

e: admin@DERmonitoring.guide

w: www.DERmonitoring.guide