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Project EDGE

DUID Telemetry Overview

Version: Final

Important notice

PURPOSE & AUDIENCE

This document describes the overview and high-level design for DUID Telemetry data and subsequent data requirements to facilitate participation in the EDGE DER Marketplace operation and to deliver Wholesale and Local Services (to Distribution Network Service Providers (DNSPs)). The Australian Energy Market Operator (AEMO) provides this information as a service targeting business and IT staff in participant organisations.

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VERSION HISTORY

Version	Effective Date	Summary of changes
Initial Draft	17/12/2021	Initial Draft for publication.
Final	21/06/2023	• Expanded Sec 1. DUID Telemetry • Included additional details into Sec 1.1 Explanation of Key Concepts • Updated Sec 1.2 When is PV controlled or not? And replaced ESS with Battery • Updated definition of Active Power and removed reference to Flex in Sec 1.4 DUID Telemetry Data contextual Overview. Active Power measurement will be done at NMI only. • Updated the Style guide and document formatting

DOCUMENTS MADE OBSOLETE

Publication of this document makes the Project EDGE DUID Telemetry Overview Initial Draft document published on 5th Jan 2022 obsolete

FEEDBACK

Your feedback is important and helps us improve our services and products. To suggest improvements, please contact AEMO's Support Hub. To contact AEMO's Support Hub use Contact Us on AEMO's website or Phone: 1300 AEMO 00 (1300 236 600) and follow the prompts.

Contents

1. DUID Telemetry

DUID Telemetry data is required by market operator for Operational Visibility and Dispatch conformance monitoring. DUID Telemetry data consists of the aggregated instantaneous period ending measurement of active power flow at NMI (connection point at a site) or at a common measurement point at a site. DUID Telemetry also consists of actual generation, actual load and actual energy stored for aggregation of all controllable (i.e., flexible) assets in the aggregator's portfolio.

DUDI Telemetry data provided by an Aggregator is for the whole of portfolio, data is aggregated from individual sites to the DUID level. Within the Project EDGE DUID Telemetry data is primarily used for two main purposes:

a. Wholesale Energy Dispatch Compliance
   - This refers to assessment of Aggregator meeting their dispatch target by AEMO.
   - Using the 'Active power flow' which is a 'positive' value for generation and a 'negative' value for load
   - Active power flow is measured at NMI (or connection point)

b. To gain Operational Visibility of aggregator portfolio
   - Using the aggregated data from only the controllable (or flexible) assets in the portfolio. The value represents the aggregation of all controllable DER assets by generation and load; DUID Telemetry data does not contain data for any individual assets or asset types.
     - Controlled generation from Solar PV and Battery (in kW),
     - Controlled load from Battery (while charging) and any smart load (for example demand response enabled hot water system - in kW) and
     - Energy Stored in Battery (in kWh)
   - Breakdown and separation of total controllable capacity at DUID level into controlled generation and controlled is critical as it provides visibility for power system operations i.e., total flexible load and generation available in market at any time. We can get visibility of the total controlled power flow across the portfolio using the controlled generation value and controlled load value.

1.1 Explanation of key concepts

Data Coverage: The data is provided for the whole of the portfolio (i.e., in EDGE, the DUID represents entire Aggregator portfolio)

Controllable (or Flexible) Assets: Any DER asset that can be remotely and actively controlled – turned on, turned off, ramped – up or ramped -down is classified as controllable or a flexible asset. In EDGE this asset capacity (generation or consumption/load or stored) is referred to as the 'FLEX' definition of quantity (kW/kWh).

The image below taking example of site having Solar PV, Battery, Smart/controllable appliances and native load explains different measurement point or location.

When capacity is measured at the connection point or network meter the definition of quantity is referred as NMI; when capacity is measured at a common measurement point which is the aggregation of all controllable or flexible assets then the definition of quantity is referred as FLEX

The small green box below represents the measurement point for all controllable or flexible assets (FLEX) whereas the red box represents the measurement for the whole site (NMI)

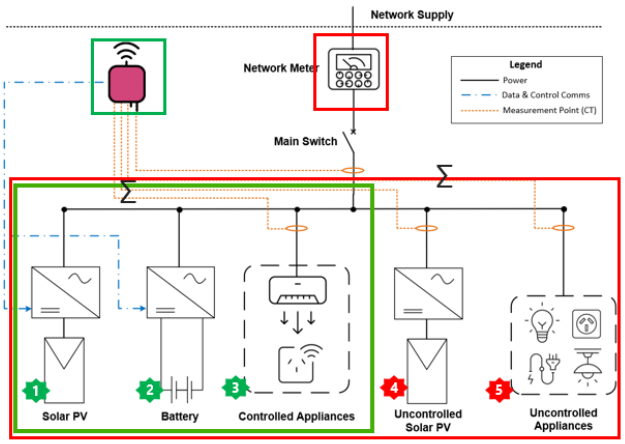
Controllable (Load and/or Generation) : Sum of controllable devices (load and/or generation; *not individual devices*) across the participant's registered portfolio of NMIs

-> Only controllable assets are considered when calculating the capacity

-> Measurement at a real/virtual measurement point
ps: not individual devices but aggregated of all controllable devices

-> Visibility of 'summation of' all controlled assets is provided via Bi-directional offer and telemetry

-> ∑ (1 + 2 + 3)



Aggregated Net Connection Point Flow: Sum of net connection point flows across the participant's registered portfolio of NMIs i.e. Net at NMI

-> All Controllable and un-controllable assets considered when calculating the net connection point flow value

-> Measured at Connection point (i.e. NMI)

-> Visibility of Net position at NMI is provided via Bi-directional offer and telemetry Separation of controlled & uncontrolled assets is not required or visible

-> ∑(1 + 2 + 3 + 4 + 5)

1.2 Solar PV: When is it Controlled or not?

Taking an example of a site with Energy Storage System (ESS) or Battery and rooftop solar (PV)

- If the Aggregator can constrain the PV output or /turn off or turn on the PV generation then the **PV is Controllable.**
- If the Aggregator is only controlling/flexing the Battery according to the outcomes of the PV generation, then PV is not being actively controlled. In other words when PV is generating, rather than reducing PV output the Battery is charged to compensate for additional Generation then **PV is not being actively controlled,** therefore must not appear in telemetry data as controlled generation**.** In the above case
  - IF uncontrolled PV Generation at sites in aggregator's fleet turns up and the battery which is controllable compensates the additional generation by charging. The quantity charged would appear in the controlled load field of the DUID Telemetry.
  - If uncontrolled PV Generation at sites in aggregator's fleet goes down and the battery compensates by discharging; the battery discharge quantity would appear in the controlled generation field of the DUID Telemetry

1.3 Worked examples

Scenario: Increase in Controlled Load

Time Stamp	Asset	Cont. Gen (kW)	Cont. Load (kW)	Energy Stored (kWh)	Comments
	ESS		-5	10	Breakout by asset for illustrative purposes
	HW System		0	-	Breakout by asset for illustrative purposes
Total @ 10:49		0	-5	10	Telemetry submitted. 1 ESS with 10kW and not charging
	ESS		-10	10.17	Breakout by asset for illustrative purposes
	HW System		-5		Breakout by asset for illustrative purposes
10:50		0	-15	10.17	Telemetry submitted. ESS charging and storage value now + 0.17kWh. 0.17kWh* was used to charge battery and 5kW of other load turned on. *assumes 100% charging efficiency for illustrative purposes.

Scenario: Increase in Controlled Generation

Time Stamp	Asset	Cont. Gen (kW)	Cont. Load (kW)	Energy Stored (kWh)	Comments
	ESS	5		10	Breakout by asset for illustrative purposes
	PV System	0			Breakout by asset for illustrative purposes
10:49		5	0	10	Telemetry submitted.
	ESS	10		8.33	Breakout by asset for illustrative purposes
	PV System	5			Breakout by asset for illustrative purposes
10:50		15	0	8.33	Telemetry submitted. ESS discharging and storage value now reduced to 8.33kWh*. Total generation 15kW is made up of 5 kW@ PV and 10kW @ ESS. *Assumes charge/discharge rate are equal and 100% discharging efficiency at for illustrative purposes.

1.4 DUID Telemetry Data contextual overview

Note: In EDGE as the Aggregator is bidding as Bi-directional resources. 'Generation' value is provided as a positive value and 'Load' value is provided as a negative value.

Item	**Active Power**	**Actual Controlled Generation**	**Actual Controlled Load**	**Actual Energy Stored**
Definition	Active Power (in kW) exported to grid or imported from grid within a dispatch interval measured at 'Connection Point' and then **aggregated to DUID level**	Actual Controlled generation in kW: The sum of actual discharge/generation activity of the DUID. **Note**: this is not intended to include uncontrolled generation such as uncontrolled PV that is not being actively controlled by the aggregator	Actual Controlled load in kW: The sum of actual charge/load activity of the DUID. **Note**: this is not intended to include un-controlled loads such as household appliance loads unless explicitly under control of the aggregator	The Actual Energy in kWh that is stored in the aggregator's portfolio that could have been discharged if required.
Description	Single value = DUID Exports minus DUID Imports • DUID Import = Active power consumed by DUID (flow of power -> GRID to DUID) • DUID Export = Active power generated by DUID (flow of power -> DUID to GRID)	• Actual Controlled Generation represents sum total of all controlled generation/discharge activity in Aggregator's portfolio. For a Battery discharging is captured as generation • For example, in an Aggregator portfolio with 5 Battery each of 1kW	Actual Controlled Load represents sum total of all controlled charge/ Load activity in Aggregator's portfolio. • For a Battery – charging is captured as load • For example, in an Aggregator portfolio with 5 Battery each of 1kW capacity. Total Available	The total energy stored, aggregated to the DUID level.

Item	Active Power	Actual Controlled Generation	Actual Controlled Load	Actual Energy Stored
		capacity. Total Available Controlled Generation is 5 kW; if each Battery is exporting 0.8 kW then Actual Controlled Generation value will be 4 kW.	Load is -5 kW. If each Battery is charging -0.5 kW then Actual Controlled Load value is -2.5 kW	
Definition of Quantity	• NMI (net at site) aggregated to DUID level	• Aggregated at DUID level and for controllable portion of portfolio only (FLEX)		
Data importance and usage for AEMO	• Used in assessing Aggregator's conformance to Wholesale energy dispatch target. This assessment is done after the dispatch interval. • State estimation	• State estimation – understanding what the system is doing in real-time. This is particularly important following a disturbance or incident; in order to manage power system security. • Use in short term generation and demand forecasting • Adjustment of near-term forecasts. The ability to see what's happening, means the system level forecasts can adjust in the near-term	As per controlled generation.	In addition to controlled generation. • Used for power system reserve assessments. For understanding how much is available, should it be required in an emergency. • Or, if a market event were to occur, such as a very high price, understanding what energy may be generated. • The energy storage information can be utilised in reserve estimations and forecasts for the

Item	**Active Power**	**Actual Controlled Generation**	**Actual Controlled Load**	**Actual Energy Stored**
		(0-2 hours ahead) for improved accuracy. • Utilisation of historic data to tune and prepare short-term forecasting models. These are used to assess power system adequacy, security, reserve management, outage planning and risk management. • Management of congestion such as network constraints in dispatch.		management of power system reliability. • Comparison between measurements provides visibility of the 'controlled load' that was battery charging as opposed to controlled load being turned on/up
Characteristics	• Aggregated sum of portfolio activity	Positive value, aggregated sum of portfolio generation/ discharge activity	Negative value, aggregated sum of portfolio load/ charge activity	Positive value, value does not consider any arrangements Aggregator will have with the end customer
Research Question Relevance	RQ4: How can the DER Marketplace facilitate efficient activation of DER to respond to wholesale price signals, operate within network limits and progress to participation in wholesale dispatch over time? • Net NMI (net at site) = value limited to dispatch	Applies to RQ4, Hypothesis A: *"DER participation in wholesale energy markets can be achieved progressively, as DER fleets reach materiality thresholds, aligning with ESB visibility and dispatchability models"* Provides retrospective visibility and situational awareness fundamental to an operable system by AEMO in a high DER future. Without this, DER will not be able to participate in energy markets at scale. RQ8: CBA – enriches CBA by showing asset type contribution to value generation in marketplace		

Item	Active Power	Actual Controlled Generation	Actual Controlled Load	Actual Energy Stored
	target compliance, no visibility			
Power Type used	Active power			
Unit of Measure	kW	kW	kW	kWh
Data aggregation Level	DUID	Aggregation of all controllable generation assets in DUID	Aggregation of all controllable load assets in DUID	Total Energy Stored available for discharge (net of technical limits like depth of charge).
Granularity (resolution or temporal qualification)	• 1 min; instantaneous period ending (each 1 min)			
Submission Frequency	1 min			

1.5 Data Definition

For DUID Telemetry data definition please refer to the Section 6.3 DUID Telemetry data Definition of Project EDGE: Data Specification Part B available at Project EDGE Technical Specification.