Project EDGE Data Specification

Part B: Market Participation & Operational Visibility Data Requirements

Version: Final

Table 1 Important notice

PURPOSE & AUDIENCE

This document describes the 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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DOCUMENTS MADE OBSOLETE

Publication of this documents makes Project EDGE Data Specification Part B Dec 2021 published on 5th Jan 2022 obsolete

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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.

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VERSION RELEASE HISTORY

Version	Effective Date	Summary of Changes
Initial Draft	19 Oct 2021	M2 Draft for ARENA effective 19 Oct, 2021. Subject to further refinement and enhancements as Project EDGE progresses through the next phase detailed design.
v1	2 Dec 2021	Initial Draft for Consultation Subject to further refinement and enhancements as Project EDGE progresses through the next phase detailed design. New Additions to the Data Specification: • DUID Telemetry Data • Availability Forecast • Boffer as Forecast Split EDGE Data Specification into a two part document as below: • **Part A**: Introduction to Data Exchange, data Obligations and Participant Enrolment • **Part B**: Market Participation and Operational Visibility Data Requirements
Final	25 May 2022	Enhance and refinement Project EDGE Data Specification specifically In Part A update • Updated Sec 4. Data Requirements to include OE and Flex OE Desktop Analysis data requirements In Part B addition of: • Enhanced Dynamic Operating Envelope (v2) – aligned to CSIP Australia (in information model) • Pre dispatch (PD) price forecasts as an input and consideration to Aggregator Boffer computation Publication of the Part C of the Project EDGE Data Specification covering: • Data requirements for DOE Economic Optimisation and Flex OE Desktop Analysis. This contains data definition for: ▪ NMI level Unconstrained Boffer (Flex and NMI) ▪ NMI Level telemetry data ▪ NMI level post-dispatch interval Operating Envelope ▪ NMI level Unconstrained Load/ Generation Forecast

1. Glossary

1.1 Abbreviations

Term	**Explanation**
Active Customer	A customer is active when participating in markets through an Aggregator (for example, Mondo).
Active DER	DER that is under active and explicit control of the Aggregator (for example, battery, controllable loads or demand response enabled devices).
Active DER Forecast	Aggregator forecast of consumer DER that they manage for a given time period (Bi-directional offers are a type of active DER forecast).
Actual Performance Data	Aggregated data set at the DUID level of actual performance data.
Aggregator	Role played by Aggregator in EDGE. Manages consumer DER for local DER trade and wholesale energy market participation.
ARENA	The Australian Renewable Energy Agency.
API	Application Programming Interface
AEMO	Australian Energy Market Operator
AEST	Australian Eastern Standard Time. Also known as Market Time or NEM time.
Bid	Submitted by controllable load for load increase or decrease.
Bid Type	Category of service for which Bi-directional Offer is submitted (Energy, Ancillary Services, Local DER Service, Network Support Service).
Bi-directional Offer ('Boffer')	An Offer that includes both generation and load. May be referred to as "Boffer".
Bi-directional Unit	An asset or a generating plant that has the capability to both: (a) consume electricity to convert into stored energy; and (b) convert stored energy to produce electricity.
Conformance Monitoring	Monitoring where dispatch targets are not met.
Constrained Bi-directional Offer	DER wholesale market offer that is self-constrained by an Aggregator using limits/constraints communicated by the DNSP through operating envelopes.

Term	**Explanation**
Composite Bi-directional Offer	Aggregation of the multiple Bi-directional Offer(s) from various Aggregator per TNI. Only applies for the Static Nodal Limit target operating model. This is part of the Security Constrained Economic Dispatch function i.e. two step solve.
DMO	Distributed Market Operator. Role played by AEMO in EDGE
DSO	Distribution System Operator. Role played by DNSP which is AusNet Services in EDGE
DOE	Dynamic Operating Envelope
DER	Distributed Energy Resources
DNPS	Distribution Network Service Provider. Owns, maintains and manages the electricity distribution network.
DUID	Dispatchable Unit Identifier, represents wholesale generation or load unit.
Data Exchange Capability	Set of capabilities and functions developed on the Platform to facilitate streamline data exchange between AEMO, DNSP and Aggregator.
DER Compliance	Assessing whether Aggregators are dispatching according to operating envelope limits and / or nodal capacity allocation.
DER Raw Capability	Capabilities that must be tested and verified before DER can be used by an Aggregator to enter a contract for DER Service delivery.
Disaggregated Dispatch	Part of the Nodal constraints operating model. The process by which a Composite dispatch target from the wholesale market is disaggregated and then sent to individual Aggregators.
DER Marketplace	Market frameworks and systems that facilitate the efficient trade of distributed energy services at both the wholesale and local level for the long-term interests of consumers.
Device Standing Data	Device data that changes infrequently, maintained and accessed within internal AEMO systems.
Dispatch Interval	Interval frequency at which service dispatch instructions are sent and the minimum service duration (5 minutes).
Dispatch Target	Issued as part of a dispatch instruction, tells an Aggregator what energy export / import target they much reach by the end of the dispatch interval.
Distributed Energy Services	Energy and non-energy services (such as voltage control) that are delivered by aggregated DER at both the wholesale and local level (within the distribution network).

Term	**Explanation**
Distribution Network Limit	Physical limits (for example, voltage, thermal) that apply within the distribution network. The limits can be applied either at NMI or distribution node level. These are applied in the dispatch process to limit the capability of a load or a generating unit such that it is unacceptable to either consume or generate the level of electrical power that would otherwise occur.
Distribution Network Node	A logical grouping of NMIs defined below the TNI within a distribution network hierarchy.
EDGE	Energy Demand and Generation Exchange
EW-DSB	Energy Web – Distributed Service Bus
Firm Bi-Directional Offer	DER wholesale market offer submitted after a nominated cut-off time – the price per band cannot be changed and quantity can change.
Generation Capacity	Capacity (kW) available for power generation/export from DER through the Grid interactive port (that is, terminal of the Inverter) into the distribution network. This refers to the controllable Device capability and not the site capability.
Load Capacity	Capacity (kW) available for power load / import to DER through the Grid interactive port (that is, terminal of the Inverter) into the distribution network. This refers to the controllable Device capability and not the site capability.
Local DER Services	Defined by the DNSP and Aggregators, not traded on wholesale markets.
Local Service Exchange	A component of the Platform for facilitating the posting, procurement and trade of real and reactive power as Local DER Services between DNSP, TNSP and Aggregators, to manage network congestion and increase network limits.
Logical Network Model	Shows the logical distribution network hierarchy down to the NMI.
MC	Market Customer (also referred as Retailer), who purchases electricity from the spot market.
MASP	Market Ancillary Service Provider, is a market participant which provide Frequency Control Ancillary Services (FCAS)
NEM	National Electricity Market, also referred as Market in this document
NER	National Electricity Rules
NMI	National Meter Identifier, National Metering Identifier, the customer DER connection point to the grid.
NEM Time	Also referred as Market Time. This is the AEST time.

Term	**Explanation**
NMI Operating Envelope	Operating Envelope applied to an individual NMI.
NMI Standing Data	Site data that changes infrequently, maintained and accessed within internal AEMO systems.
Nodal Capacity Limits	Nodal capacity limits are thermal limits associated with distribution network nodes (low voltage (LV) circuit up to bulk substation). In Project EDGE, nodal capacity limits may be used to constrain wholesale bi-directional offers as part of the security constrained economic dispatch (SCED) function within the Static Nodal Constraints model.
Offer	Submitted by generators to provide power/energy (power generation).
Operating Envelope	Power export (to grid) & import (from grid) limits provided by DNSP to Aggregators and AEMO.
Operational Forecast	Aggregated data set at the DUID level of anticipated active power flows.
Optimised Operating Envelope	Import/export limit updated with Bi-directional offer and network configuration information at a greater frequency than static Operating Envelopes.
Participant ID	Unique identifier for a Participant.
Passive DER	DER that is not controllable (that is, Rooftop PV).
Peak Demand	Periods where wholesale demand has reached a peak and local load may need to be curtailed.
Peak Generation	Periods where wholesale generation has reached a peak and local load may need to be increased.
Platform	An off-market, proof-of-concept, technology platform for facilitating trade of DER energy and ancillary services between buyers and sellers at wholesale and local levels. The Platform is common to Project EDGE and Project Symphony.
Reactive Power (Q)	The consumption and export (supply) of Var (for example, over a distribution network for voltage management).
Real Power (P)	The actual amount of power being used, or dissipated, in a circuit (the generation or consumption of Watts).
Regional Bi-directional Offer	DER Bi-directional Offer by Aggregator for the whole region (that is, the National Electricity Market (NEM) Jurisdiction). The Offer will consist of the 10 Price bands, Quantity offered and set of NMIs making up the Offer.
Scheduled Resource	Assets that, as either net generators or net consumers (load) of electricity, participate in the central dispatch and pricing processes operated by AEMO.

Term	**Explanation**
Security Constrained Economic Dispatch (SCED)	Two-step solve process that is part of the Static Nodal Constraints wholesale target operating model (TOM).
Settlement Simulation	Off-market settlement activity intended to show customer value gain for a given trading period.
Static Network Location Limit	Provided by DNSP with operating envelope for use with static nodal model.
Static Operating Envelope	Import/export limit set through combination of customer connection agreement with DNSP and forecasts.
Technology Type	This refers to the control system and the response available from the Aggregator portfolio. The two types of controllers are as: Variable or Proportional Controller Switch Controller
TNI	Transmission Node Identifier. Bulk substations at the interface between the transmission and distribution networks, used as the connection point for the wholesale spot market.
Trading Interval	This refers to the half hour interval, used in Settlement processes. Note within this interval there will likely need to be 5 min energy dispatch intervals in this demonstration.
TSO	Transmission System Operator; AEMO's function outside of these demonstration projects.
VPP	Virtual Power Plant
Value Stacking	Value stacking means having the capability to perform and capture the commercial value of multiple energy services at the same time.
Wholesale Integration	Set of capabilities and functions developed on the Platform to facilitate Aggregator and DNSP participation in wholesale services/Local DER Services.
Wholesale Clearing Price Comparison	Comparison of DER Bi-directional Offers and Composite offers to the wholesale spot clearing price to prepare a merit order and determine which offers are cleared for dispatch.
WTD	Willingness to Deliver
WTP	Willingness to Pay

1.2 Key Concepts

Term	Explanation
Dispatch Interval (DI)	Dispatch Interval or DI is the 5-minute interval for which Aggregator is sent an dispatch target and it is the trading period for which the electricity price is set in the market known as spot price. • It is provided as interval ending (as in DI end time)

Term	Explanation
	• It is of 5-minute duration. • There are 288 5-minute DI in a NEM trading day – DI start time refers to the start time of the Dispatch Interval – DI End time refers to the end time of the Dispatch Interval • For Dispatch Interval of 10:00 hrs – DI start time would be 9.55 – DI end time would be 10.00
Trading Interval (TI)	A period of time prescribed in the National Electricity Rules for the wholesale exchange. It is of 5-minute duration. • There are 288 5-minute TI in a 24-hour period. • E.g. for TI 10.00 TI start time would be 9.550 and TI end time would be 10.00
Trading Day	The 24-hour period from 0400 hrs to 0400 hrs the following day
Gate Closure for Boffer	• 12.30 PM the day before the Trading day. – At this time the **price bands are firmed (fixed) for the following trading day**; – Any Boffers submitted after 12.30 PM trading day -1 , for the trading day are considered as Re-bids • Aggregator has the flexibility to adjust the volume (i.e. quantity) offered in each of the price band for the trading • Aggregator must not update the price in the price bands. AEMO will reject the re-bid if the prices are changed in the price band. • After 12.30 the band prices for the following day cannot be updated.

2. Part B: Market Participation & Operational Visibility Data Requirements

EDGE Data Specification is published to provide Aggregators and interested parties with detailed overview of the integration to EDGE Marketplace, data obligations for participating in Project EDGE.

Its contents are for the purpose of facilitating the research activities of Project EDGE and **are not intended to set a precedent to be adopted within current or future market arrangements**. The project intends to gather evidence to inform future market arrangements that would occur through appropriate consultation processes.

For ease of consumption the EDGE Data Specification is presented as a two-part document as described below:

2.1 Part A: Introduction to Data Exchange, Data Requirements and Participant Enrolment

Part A covers the introduction to Project EDGE and data exchange, followed by overview of the data obligations for participation into trial and enrolments and on-boarding specific data requirements for Aggregator and DNSP.

2.2 Part B: Market Participation & operational Visibility Data Requirements

This document forms the Part B of the Project EDGE Data Specification.

Part B covers the Project EDGE data requirements for market participation i.e. provision of Dynamic Operating Envelopes (DOE) for enforcing distribution level constraints, provision of Bi-directional Offers for Energy (Boffer) – providing Aggregator intent, pre-dispatch price forecast as an input to Boffers and AEMO dispatch instructions.

Part B also covers data requirements for Operational Visibility of the Aggregators portfolio to AEMO. This includes DUID Telemetry data, Operational forecasts (provided via Boffer) and Availability Forecasts.

Please note: for the purpose of the Project EDGE, AEMO will treat the Boffer submitted by Aggregator every 5 mins covering 48 hrs as the Aggregators operational forecasts. No separate Operational Forecast data feed is required.

- Market Data requirements in

  - Bi-directional Offer (Boffer)
  - NMI Operating Envelopes (DOE)
  - Dispatch Instructions
- Operational Visibility data requirements in
  - DUID Telemetry (Aggregated Operational Data)
- Pre-dispatch Price Forecast

2.3 Part C: DOE Economic Optimisation and Flex OE Desktop Analysis Data Requirement

Part C covers the Project EDGE data requirements for DOE economic optimisation and Flex OE desktop analysis. All data provided must be at NMI level; as listed below:

- Forecast Data : Pre-dispatch Uncontrolled Load or Generation forecast at NMI level
- Unconstrained Boffers
  - Pre-dispatch NMI level Boffer for 'Flex' (i.e. aggregation of all flexible assets at the site)
  - Post-dispatch NMI level Boffer at 'NMI' (i.e. measure at the NM(- net of site)
- Telemetry Data
  - NMI level Telemetry data including reference to DOE applied during that interval
- Operating Envelope: Post-Dispatch DOE containing with reference to objective function

3. Bi-directional Offers (Boffer)

Bi-directional Offers or Boffers are submitted by the Aggregator for intending to deliver Wholesale Energy service and to provide operational visibility of their portfolio to AEMO. As the trial progresses through various phases the application of Boffers will also go through a progression. The data definition of the Boffers remains firm as we progress through various phases depicted by

- Step 1: Visibility
- Step 2: Self Dispatch
- Step 3: Scheduled

Boffers submitted by the Aggregator serves two purposes:

- Boffer are used as Aggregator's forecast by AEMO Operations (Step 1)
- Boffer are used for market participation and generation of dispatch target for Aggregator (Step 2 and 3)

The table below describes this progression from providing operational visibility in Step 1 to bi-directional bidding as a scheduled resource in Step 3.

3.1 Boffer for Wholesale Energy

Item	**Item Description**	**Step 1: Visibility**	**Step 2: Self Dispatch**	**Step 3: Scheduled**
Boffer Characteristic	Type of Boffer	Forecast Boffer: Aggregator uses price/quantity ($/qty) Boffer to provide DUID level forecasts.	Forecast & Market Participation Boffer: Aggregator uses Energy Fixed Loading (EFL) field to: a. Provide DUID level forecast b. self-nominates a dispatch target for the dispatch interval.	Forecast & Market participation Boffer: Aggregator uses EFL field or Price/Quantity pairs to a. Provide DUID level forecast b. offer quantity (load and/or generation) to deliver wholesale energy services
Boffer Purpose	What is the purpose of the Boffer provided in Step 1 to 3	• Provides operational visibility to AEMO • No market participation • Dispatch target sent by AEMO	• Provides operational visibility to AEMO • Passive market participation • Price taker Boffer and doesn't	• Provides operational visibility to AEMO • Active market participation • Price Setter Boffer. In EDGE this will not

Item	**Item Description**	**Step 1: Visibility**	**Step 2: Self Dispatch**	**Step 3: Scheduled**
		• Aggregator is not required to act on or respond to the dispatch target	influence clearing price calculation. • Dispatch target sent by AEMO • Aggregator is required to act on and respond to the dispatch target	influence NEM clearing price • Dispatch target sent by AEMO • Aggregator is required to act on and respond to (or meet) the dispatch target.
Def. of Quantity	Where the offered quantity is measured	• Aggregated net Connection Point flow (i.e. Net NMI) • Controllable assets only (i.e. Flex)		
Offer Quantity	How load & generation is represented	• Load quantity offered as '-ve' value • Generation quantity offered as '+ve' value		
Boffer Option	How Boffer is constructed	Quantity offered as price/quantity pairs in 20 price bands.	Quantity offered only in EFL	Quantity offered as price/quantity pairs in 20 price bands or in EFL
Boffer Submission/ Re-bid	The frequency of submission of Boffer/Re-bid	12.30 PM (AEST) day ahead	1st Boffer: 12.30 PM (AEST) day ahead	1st Boffer: 12.30 PM (AEST) day ahead
Re-bid	Re-bidding Frequency	Continuous; every 5 minutes		
Boffer Time Horizon	Time period covered by Boffer	• 48 hrs ahead from submission • 48 hrs rolling time period • Data for past intervals not required		
Boffer Granularity & Period	Time resolution & time period covered by Boffer	• 5min • A submission must consist of all 576 5-min intervals in the 48-hr period		
Boffer Composition	The aggregated level at which Boffer is constructed	• DUID; In EDGE DUID represents the whole of Aggregator portfolio. Thus, a Boffer as well represents whole portfolio		
Quantity make-up	What does the quantity offered represents	• The quantity offered in the Boffer represents whole of the portfolio		

Item	**Item Description**	**Step 1: Visibility**	**Step 2: Self Dispatch**	**Step 3: Scheduled**
Offer Load and/or Generation	Does the Boffer contains both load and generation	Yes; Aggregator can offer Generation and/or Load		
Boffer Validation	What Boffer validation are applicable per step	• Schema validation • Data submitted for 48hrs i.e. has data for all 576 5min intervals	• Schema validation • Business validation • EFL check	• Schema validation • Business rule validation • EFL check • maxAvailLoad check • maxAvailGen check • Maximum Generation and Maximum Load capacity check
Boffer Gate Closure Rule	What Gate closure rule is applicable Boffer	Aggregator price bands are firmed and locked at 12.30 PM a day before trading day[1] i.e. (T-1). After that time an Aggregator can only change the quantity but not the price bands.	Not applicable	Aggregator price bands are firmed and locked 12.30 PM trading day-1. After that time an Aggregator can only change the quantity but not the price bands.

Notes:

- **Generation quantity** (injection into grid) is represented as a **+ve value** quantity number in Boffer.
- **Load quantity** (consumption from grid) is represented as a -**ve value** quantity number in Boffer.

3.2 Boffer Data Characteristics

Dataset Name	Wholesale Energy Boffer
Description	Bi-directional Offers ('Boffer') for Energy submitted by the Aggregator for the total (net position) or controllable (flexible) price responsive DER Asset in their portfolio. The Boffer is submitted at the DUID level (representing whole of portfolio)
Information Classification	Confidential

[1] In NEM a Trading Day is defined as a 24 hour period commencing 4:00 AM AEST and finishing at 4:00 AM on the following day. EDGE will adopt same Trading Day definition.

Dataset Name	Wholesale Energy Boffer
Publication Frequency	Minimum every 5 mins
No of records in a Boffer/Re-bid submission	• A Boffer or Re-bid: must have data for all trading intervals in the following 48hrs at time of submission thus representing a total 576 records. • These 576 records will represent all 576-5min dispatch interval in the 48 hour period.
Data Submission	• Boffer/Re-bid submitted by Aggregator to AEMO. • AEMO on receipt of the Boffer/Re-bid will – Validate Boffer & send successful acceptance or rejection acknowledgement to Aggregator
Initiating Participant	Aggregator
Recipient Participant	AEMO
Submission Acknowledgement	The Aggregator should expect up to two acknowledgements from AEMO. 1. System Acknowledgement: indicating successful/ failed data submission to AEMO. System acknowledgements are generated as a result of Schema validations. Aggregator will be provided with a 'msg-ID#' and response message. 2. Transaction Processing Acknowledgement: indicating acceptance/ rejection of the Boffer by AEMO. Transaction acknowledgements are generated as result of applying Business validations. Aggregator will be provided with the successful acceptance or rejection of Boffer acknowledgement response message and code.

3.3 Boffer Data Definition

Aggregator is required to submit the Boffer for Wholesale Energy to participate in the Market. The following table captures the data definition for the Boffer for Wholesale Energy.

ID	Attribute Name	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
1	duid	DUID	String	Dispatchable Unit Identifier. This is used by EDGE marketplace to generate dispatch instruct for. This represents the system aggregation point of Aggregator portfolio.	Y	N	• 8 digit alphanumeric • Min length = 8 • Max length = 8 • Universally unique
2	bofferSummationLevel	Boffer Summation Level	String	**This specifies the capacity points summed** to calculate the Boffer. • NMI: A Boffer that represents the aggregated net position at connection point (including native loads). • Flex: A Boffer that represents only the aggregated controllable portion of the portfolio (i.e. all controllable loads or all controllable generations)	Y	N	
3	accumulateBands	Accumulate Bands	Boolean	A 'Y' value specifies that the band availabilities are aggregated (summed-up) to the total availability at the band.	Y	N	For EDGE Aggregator will always submit Boffer as Accumulate Quantity
4	energyBids		Array - object	Array for Wholesale Energy Boffer	Y	N	
4.1	tradingDate	Trading Date	String – 'date'	The provides the effective trading date for this Boffer i.e. date for which the Boffer is valid for.	Y	N	• Valid Date • Format: yyyy-mm-dd

ID	Attribute Name	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
							• Trading Date must be a current date or future date. • Can't be a past date
4.2	prices		Array - Number	The 20 price bands across which aggregators will offer quantities either as load or as generation. • The price bands will start from price band 1 and will go up to price band 20. • The price bands will always increase from the lowest price band to highest band • Price Band 1 to 10 are for indicating prices for load quantity • Price Band 11 to 20 are for indicating prices for generation quantity	N	N	• Multiple of 0.01; • Must contain 20 items
4.4	energyPeriods		Array - Object	An array of 5min trading intervals.	Y	N	• Unique Items = True • Maximum no of items = 288
4.4.1	periodId	Period ID	Integer	Period ID refers to the 5 min Dispatch Interval Id. This is the trading Interval identifier. • The 1st period starts at 0400 hrs and ends at 0405 hrs – PeriodId = 1 refers to 1st trading interval of the trading day – PeriodId = 288 refers to the last trading interval of the trading day • For a given trading date, Period ID must be between 1 and 288	Y	N	• 1 ≤ periodId ≤ 288; • Minimum value = 1 • Maximum value = 288

ID	Attribute Name	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
4.4.2	fixedLoad	Energy Fixed Loading	Number	Fixed unit output in **kW**. This is the fixed level of load or generation offered by the Aggregator into the market. • By putting a valid value in the 'fixedLoad' field the Aggregator is essentially nominating their own dispatch target (i.e. also referred as self-dispatch). • If don't want to use fixedLoad, then the attribute value must be NULL • "0" is considered a valid value	N	Y	• A 'non-null' value in 'fixedLoad' overwrites all other $/qty capacity offer provided in Boffer. • Decimal (8,3)
4.4.3	maxAvailLoad	Maximum Load Availability	Number	The maximum load availability for a dispatch interval, in **kW**. • Using 'maxAvailLoad' Aggregator can constrain or limit the maximum amount of load the Aggregator can be dispatched for. This represents the upper bound on load for the Aggregator	Y	N	• Must be less than equal to maximum load capacity (absolute value) • Decimal (8,3)
4.4.4	maxAvailGen	Maximum Generation Availability	Number	The maximum generation availability for a dispatch interval, in **kW**. • Using 'maxAvailGen' Aggregator can constrain or limit the maximum amount of generation an Aggregator can be dispatch for. This represents the upper bound on the generation for Aggregator.	Y	N	• Must be less than equal to maximum generation capacity • Decimal (8,3)
4.4.5	bandAvail		Array	The set of **20** band availabilities refers to the capacity or quantity the Aggregator is willing to offer in the market at a certain price. • Band 1 to 10 are load bands and **Load** quantity is provided as '-**ve**' value • Band 11 to band 20 are generation bands and **Generation** quantity is provided as **'+ve'** value	N	N	• Must contain 20 items • Sum of band availabilities (i.e. quantity) across all the band 1 to 10 and band 11 to 20 for an dispatch interval must be less than or equal

ID	Attribute Name	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
				• This band availability provides the availability for each of the price band			to maximum load and generation capacity respectively
5	submissionDateTime	Submission Date Time	String 'date-time'	This timestamp is provided by the Aggregator in the Boffer (i.e. the Boffer Timestamp). • This timestamp must be provided in NEM time and is used by AEMO to determine the most recent Boffer submitted for a trading day.	Y	N	• Provided in NEM time. • Expected format: yyyy-MM-ddThh:mm:ss

3.4 Boffer Ingestion Business Rules Validation

The following validation rules are applied by the EDGE marketplace post the schema validation. On successfully clearing the below validation rules, Boffer is accepted by the Market operator and an acknowledgement is sent to the Aggregator.

Rule ID	Attribute	Validation Rule	Description
1	tradingDate	Trading Date Check	• Must be provided in 'yyyy-mm-dd' format. • Trading Date must be a current date or future date. • Trading date cannot be a past date.
3	periodId	Period ID Check	• For a trading date periodId must be unique and its value must be between 1 and 288 – Minimum allowed value = 1 – Maximum allowed value = 288
4	fixedLoad	Maximum Load Capacity check	• If EFL is offered as Load quantity for a dispatch interval than EFL value must be less than or equal to DUID Maximum Load capacity (absolute value)
5	fixedLoad	Maximum Generation Capacity Check	• If EFL is offered as Generation quantity for a dispatch interval than EFL value must be less than or equal to DUID Maximum Generation capacity
6	priceBands	Price Band Check	• Prices must increase from left to right for Load price bands 1 to10 • Prices must increase from left to right for Generation price bands 11 to 20 • No Load offer with quantity can have a higher price than Generation offer with quantity
7	priceBands and bandAvail	Price Band Qty Check - $/non zero qty check	• A Boffer must not have for a 'non zero quantity' same price band value in load bands and generation bands
8	**bandAvail** (i.e. ∑ bandAvail 1 to 10)	Maximum Load Capacity check	Sum of load band availabilities (i.e. quantity offered in Band 1 to band 10) across the price bands for a dispatch interval must be less than or equal to DUID Maximum Load capacity (absolute value)
9	**bandAvail** (i.e. ∑ bandAvail 11 to 20)	Maximum Generation Capacity Check	Sum of generation band availabilities (i.e. quantity offered in Band 11 to band 20) across the price bands for a dispatch interval must be less than or equal to DUID Maximum Generation capacity
10	maxAvailGen	Maximum Availability	maxAvailGeneration must be less than or equal to Maximum Generation Capacity.

Rule ID	Attribute	Validation Rule	Description
		Generation Check	
11	maxAvailLoad	Maximum Availability Load Check	maxAvailLoad must be less than or equal to Maximum Load Capacity (absolute value).
12	priceBands	Re-bid/ Gate Closure Check	For a trading day in the Re-bid the price band values must be same as the price band value of the Boffer submitted at or prior to gate closure for that trading day. Aggregator can change the quantity among the price bands.

Boffer gate Closure: For a trading day Aggregator is permitted to update band availability and prices up to 12.30 PM a day prior to start of the trading day (i.e. trading day -1). Post that Aggregator can only update offer quantity.

If the aggregator updates price after the gate closure for a trading day AEMO will reject the Boffer. The price bands for a given trading day are locked in at 12:30pm the day before.

3.5 Boffer Processing (Market Solve) Business Rules Validation

The following validation rules are applied by the EDGE marketplace when clearing the Boffer (i.e. solving the market) with a goal to generate dispatch targets for the Aggregator. Once a dispatch target is generated then dispatch instruction is sent to the Aggregator.

Rule ID	Attribute	Validation Rule	Description	Order	Exception
1	submissionDateTime	Identify Recent Boffer	The market solve selects the Boffer based on the submission order for clearing. Thus, must always select the Boffer with most recent submissionDatetime for market clearing	**1**	No
2	tradingDate	Trading Date Check	• Trading Date must be a current date.	2	If Boffer for current trading date is not available then use the last successfully ingested Boffer and carry forward the values.
3	fixedLoad	EFL Check	This refers to Energy Fixed Load override.	3	No

Rule ID	Attribute	Validation Rule	Description	Order	Exception
			• A 'non-null' value in 'fixedLoad' overwrites all other bandAvail values in Boffer provided fixedLoad value is <= ∑NMI-OEs. – If not; then constraint the quantity so that it is <= ∑NMI-OEs • **For Generation quantity**: fixedLoad value must be less than or equal to sum of all NMI operating envelope export limits. • **For Load quantity**: fixedLoad value must be less than or equal to sum of all NMI operating envelope import limits.		
4	bandAvail	Pre-Solve (i.e. aggregated NMI Operating Envelope check)	Check Sum of bandAvail <= ∑NMI-OEs. • If Yes, take the quantity for clearing • If not constraint the quantity so that Sum of bandAvail <= ∑NMI-OEs, **For Load Band (Band 1 to Band 10)** • Sum total of all negative band availability must be less than or equal to sum of all NMI operating envelope import limits. **For Generation Band (Band 11 to Band 20**) • Sum total of all positive band availability must be greater than or equal to sum of all NMI Operating envelopes export limits,	4	fixedload rule takes precedence
5	maxAvailLoad	Max avail Load override	• For market solve, sum total of load band (band 1 to band 10) is constrained by maxAvailLoad value • For example, maxAvailLoad value of -20kW will constrain the aggregator's total load offer to 20 kW irrespective of total load quantity offered across **the** price bands.	3	fixedload rule takes precedence
6	maxAvailGen	Max avail Gen override	• For market solve, sum total of generation band (band 11 to band 20) is constrained by maxAvailGen value • For example, maxAvailGen value of 20kW will constrain the aggregator total generation offer to 20 kW irrespective of total generation quantity offered across the price bands**.**	4	fixedload rule takes precedence

4. NMI Dynamic Operating Envelopes (DOE)

NMI level Dynamic Operating Envelopes (DOEs) are published by the DNSP and are provided to Aggregator and AEMO for the purpose of applying distribution network limits to customer imports and exports during local network and wholesale services provision.

The Project EDGE team has developed and enhanced a sophisticated data schema for NMI level Operating envelopes (v2) to mitigate issues around scalability and payload size as identified from early trialling with current implementation (v1) of the schema. The enhanced schema is referred as NMI DOE v2. This data structure is also aligned to and build on the Common Smart Inverter Profile - Australia[2] ('CSIP-AUS') adopted by SAPN in their implementation of flexible exports[3].

NMI DOE v1 is currently in use and is being phased out in next few months. The current NMI DOE (v1) schema will be replaced with the NMI DOE v2; and it is expected that all new aggregators on joining Project EDGE will use NMI DOE v2 schema only.

4.1 NMI DOE for Wholesale Energy

Item	Description	Step 1: Day Ahead Publication	Step 2: Intraday Update
Publication Frequency	The frequency of publication of operating envelopes	Day ahead (i.e. Trading Day* – 1 day)	Day ahead & Trading day update (frequency TBC)
NMI DOE Purpose	What is the purpose of the provided NMI DOE	• NMI DOE are used to enforce distribution level constraints into market clearing • NMI DOE are used to constrain Aggregator Boffer • NMI DOE are used in NMI DOE Compliance by DNSP	
Limit Type and Direction	The type and direction of limits to be included in operating envelopes	• Active Power Import • Active Power Export	• Active Power Import • Active Power Export • Reactive Power injection/absorption • Voltage (+/-)

[2] CSIP Australia (https://arena.gov.au/assets/2021/09/common-smart-inverter-profile-australia.pdf)

[3] SA Power Network Flexible Exports Trial (https://arena.gov.au/projects/sa-power-networks-flexible-exports-for-solar-pv-trial/)

4.2 NMI DOE Data Characteristics

Dataset Name	**NMI Operating Envelope (DOE)**
Description	NMI level Operating Envelopes are calculated and produced by DNSP. These distribution level limits are shared with the Aggregators and AEMO.
Information Classification	Confidential
Publication Frequency	• Step 1 Day Ahead: Once a day (i.e. trading day -1 day). • Step 2: Intraday updates
No of records	• Step 1 Day Ahead: For all NMIs in the EDGE; and for each NMI – DOE for each 5 min interval • Step 2: *DOE provided for all NMIs in the DNSP portfolio*
Data Submission	• DOE are submitted by DNSP to AEMO for all NMIs in the EDGE • AEMO on receipt of the DOE will – Validate the NMI DOE & send successful/rejection acknowledgement to DNSP – Send NMI DOE for the NMIs in the Aggregator portfolio to Aggregator
Initiating Participant	DNSP
Recipient Participant	1. Aggregator 2. AEMO
Submission Acknowledgement	The DNSP should expect up to two acknowledgements from AEMO. 1. System Acknowledgement: indicating successful/ failed data submission to AEMO. DNSP will be provided with a 'msg-ID#' and response message. 2. Transaction Processing Acknowledgement: indicating acceptance/ rejection of the Dynamic NMI DOE by AEMO. DNSP will be provided with the successful/ rejection acceptance acknowledgement code and response message.

4.3 NMI DOE Data Definition (v2)

DNSP is required to publish and submit the Dynamic NMI Operating Envelopes (DOE) to AEMO for the purpose of applying limits/constraints to the market solve and generating the dispatch targets. To do this, AEMO will use these DOE to ensure Boffers submitted by Aggregator doesn't breach any DOE. AEMO will also communicate DOEs to the relevant aggregators so that they can constrain their Boffers (bids) to be within those distribution network constraints. AEMO and existing Project EDGE participants are now in process of migrating to the NMI DOE v2.

ID	Attribute	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
1	participantId	String	Unique identifier of the participant. Provided by the Participant	Y	N	6 character, alphanumeric Universally unique (AEMO enforced)
2	transactionId			N	Y	
3	submissionTimestamp	String with format = 'date-time'	This filed conveys the date time Operating Envelopes are sent to the Market Operator by DSO	Y	N	Format: yyyy-mm-ddThh:mm:ss+10:00
4	oeApplicatonLevel	String	Identifies the DOE application level	Y	N	'NMI', 'FLEX'
5	operatingEnvelopes[]	Array	An array of DOE	Y		
6	operatingEnvelopes[].nmi	String	NMI identifier. NMI must be submitted without the checksum	Y	N	10 character, alpha numeric
7	operatingEnvelopes[].intervals[]	Array	An array of intervals	Y		
8	operatingEnvelopes[].intervals[].derControl[]	Object	Distributed Energy Resource (DER) time/event-based control object. DER Control will be specific for NMI - Interval combination			

ID	Attribute	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
9	operatingEnvelopes[].intervals[].derControl[].creationTime	Number	The time at which the Event was created. In this instance, the time at which the Operation Envelope is generated. This field conveys time of Operating Envelope creation in epoch i.e. when the DOE was calculated	Y	N	10 digit integer
10	operatingEnvelopes[].intervals[].derControl[].interval[]	Object	The period during which the Event applies. Interval array to specify the start time and duration of the DER control			
11	operatingEnvelopes[].intervals[].derControl[].interval[].start	Number	Date and time of the start of the interval This refers to the start time from which the DOE is valid and applicable. This 'start' time is aligned to the start of an dispatch interval (i.e. 5 minute boundary).	Y	N	10 digit integer The 'start' time must align with the Dispatch Interval start time in NEM.
12	operatingEnvelopes[].intervals[].derControl[].interval[].duration	Number	Duration of the interval, in seconds. This refers to the duration in seconds for which the DOE is valid and applicable for. The duration could for 1 DI or could cover multiple DIs.	Y	N	Multiple of 300
13	operatingEnvelopes[].intervals[].derControl[].derControlBase[]	Object	Distributed Energy Resource (DER) control values			
14	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModExpLimW[]	Object	The opModExpLimW function sets site Export Limit (in Watts) . This limitation may be met e.g. by reducing PV			

ID	Attribute	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
			output or by using excess PV output to charge associated storage. This refers to the active power export limit			
15	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModExpLimW[].multiplier	Number	Power Of Ten Multiplier. Specifies exponent for unit of measurement.	Y	N	value must be >= 0 Multiplier set to 0 for W Multiplier is exponent (i.e. power of ten multiplier type)
16	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModExpLimW[].value	Number	Value in watts Active Power Export limit in W	Y	N	value must be >= 0
17	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModImpLimW[]	Object	The opModImpLimW function sets site Import Limit (in Watts) . This limitation is met e.g. by reducing PV output which is self consumed, turn on controllable load or by charge energy storage.			
18	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModImpLimW[].multiplier	Number	Power Of Ten Multiplier. Specifies exponent for unit of measurement.	Y	N	value must be >= 0 Multiplier set to 0 for W Multiplier is exponent (i.e. power of ten multiplier type)
19	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModImpLimW[].value	Number	Value in watts Active Power Import limit in W	Y	N	value must be >= 0
20	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModExpLimVar[]	Object	The opModExpLimVar function sets site Export Limit (in Var) .			

ID	Attribute	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
			This function does not exist in CSIP nor CSIP-AU and will required additional DERControlMode to be added as part of the DER Management Envelope Extensions. This sets cap for LSE reactive power export service			
21	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModExpLimVar[].multiplier	Number	Power Of Ten Multiplier. Specifies exponent for unit of measurement.	N	Y	value must be >= 0 Multiplier set to 0 for Var Multiplier is exponent (i.e. power of ten multiplier type)
22	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModExpLimVar[].value	Number	Value in volt-amperes reactive (var)	N	Y	value must be >= 0
23	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModImpLimVar[]	Object	The opModImpLimVar function sets site Import Limit (in Var) . This function does not exist in CSIP nor CSIP-AU and will required additional DERControlMode to be added as part of the DER Management Envelope Extensions. This sets cap for LSE reactive power import service			
24	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModImpLimVar[].multiplier	Number	Power Of Ten Multiplier. Specifies exponent for unit of measurement.	N	Y	value must be >= 0 Multiplier set to 0 for Var Multiplier is exponent (i.e. power of ten multiplier type)

ID	Attribute	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
25	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModImpLimVar[].value	Number	Value in volt-amperes reactive (Var)	N	Y	value must be >= 0
26	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModPQOE[]	Object	The opModPQOE function sets enhanced site Import and Export Limit with a Customized DERCurveType . This function and the DERCuveType it referenced do not exist in CSIP nor CSIP-AU and will required additional DERControlMode to be added as part of the DER Management Envelope Extensions.			
27	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModPQOE[].DERCurve.CurveData	Array	Data point values for defining a curve or schedule			
28	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModPQOE[].DERCurve.CurveData.xvalue	Number	The data value of the X-axis (independent) variable, depending on the curve type. In this instance, it is the absolute site active power. Positive when exporting to grid, negative when importing from grid.	N	Y	
29	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModPQOE[].DERCurve.CurveData.yvalue	Number	The data value of the Y-axis (dependent) variable, depending on the curve type. In this instance is the absolute site reactive power. Negative when DER is absorbing reactive power, positive when DER is injecting reactive power.	N	Y	

ID	Attribute	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
30	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModPQOE[].xMultiplier	Number	Power Of Ten Multiplier for X-axis. Specifies exponent for unit of measurement.	N	Y	value must be >= 0 Multiplier set to 0 for Var Multiplier is exponent (i.e. power of ten multiplier type)
31	operatingEnvelopes[].intervals[].derControl[].derControlBase[].opModPQOE[].yMultiplier	Number	Power Of Ten Multiplier for Y-axis. Specifies exponent for unit of measurement.	N	Y	value must be >= 0 Multiplier set to 0 for Var Multiplier is exponent (i.e. power of ten multiplier type)

4.4 NMI DOE Data Definition (v1) (retired, do not use)

NMI DOE v1 is provided here for recording keeping and information only. This schema version is currently planned to be retired prior to August 2022 as the project found from early testing that this schema would not be scalable in terms of volume of data exchange. AEMO expect all new and additional aggregators on Project EDGE will adopt and start consuming the NMI DOE v2.

ID	Attribute	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
1	participantId	Participant ID	String	• Unique identifier of the participant. Provided by the Participant	Y	Y	• 6 digits alphanumeric • Universally unique (AEMO enforced)
2	oeApplicationLevel	OE Level of Application	String	This specifies the level of application at which Operating Envelopes are defined by the DNSP. If	Y	N	• For Net CP flow = Net NMI • For Controllable only = Flex

Project EDGE Data Specification: NMI Dynamic Operating Envelopes (DOE)

ID	Attribute	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
				• 'NMI' means DOE applicable to the aggregated net Connection Point flow at the sited • 'Flex' means DOE applicable to only summation of controllable load and/or generation at the site			
3	operatingEnvelopes		Array	An array of DOE			
3.1	nmi	NMI	String	NMI identifier. NMI must be submitted without the checksum	Y	Y	10 character, alpha numeric
3.2	Intervals		Array	An array of 288 5min intervals			
3.2.1	activePowerExportLimit	Active Power Export Limit	Number	Active Power Export limit applicable to the specified interval, in kW	Y	N	Decimal (4,2)
3.2.2	activePowerImportLimit	Active Power Import Limit	Number	Active Power Import limit applicable to the specified interval, in kW	Y	N	Decimal (4,2)
3.2.3	reactivePowerExportLimit	Reactive Power Export Limit	Number	Reactive Power Export Limit in combination with Active Power Import Limit in kVar	Y	Y	Decimal (4,2)
3.2.4	reactivePowerImportLimit	Reactive Power Export Limit	Number	kVar	Y	Y	Decimal (4,2)
3.2.5	diStarttime	Dispatch Interval Start Time	datetime	Start of the specified dispatch interval. The interval start date and time must align with the Dispatch Interval start time in NEM.	N	Y	• Provided in NEM time • Format: yyyy-mm-ddThh:mm:ss+10:00

Project EDGE Data Specification: NMI Dynamic Operating Envelopes (DOE)

ID	Attribute	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
3.2.6	diEndtime	Dispatch Interval End Time	datetime	End of the specified dispatch interval. The interval end date and time must align to the Dispatch Interval end time in NEM	N	Y	• Provided in NEM time • Format: yyyy-mm-ddThh:mm:ss+10:00
4	submissionTimestamp	Submission Datetime	datetime	Specifies the date/time of record creation (relevant to OE update)	N	Y	• Provided in NEM time • Format: yyyy-mm-ddThh:mm:ss+10:00

4.5 NMI DOE Business Rules Validation

Rule ID	Attribute	Validation Rule	Description	Exception
	nmi	10 chars	Field value = 10 chars	
1	diStarttime	NEM Market Time	Interval Start Time must be provided in NEM market time format and must align to DI start time	
2	diEndtime	NEM Market Time	Interval End Time must be provided in NEM market time format. And End time must align to DI end time	
3	createdDate	NEM Market Time	Created Date must be provided in NEM market time format	
5	activePExportLimit	Must not be negative value	Field value must be >=0	
6	activePImportLimit	Must not be negative value	Field value must be >=0	
7	reactivePExportLimit	Must not be negative value	Field value must be >=0	
8	NMI portfolio check	The DOE provided must cover all NMIs in individual Aggregator portfolio.		

5. Dispatch Instruction

Dispatch Instructions are generated and issued by AEMO to Aggregators for the purpose of meeting the balance of demand and supply in the EDGE DER Marketplace. AEMO will generate and send dispatch instructions every 5 mins to Aggregators participating in EDGE. It is expected that the Aggregator will meet the dispatch targets before end of the dispatch interval.

Assessment of conformance and compliance to the dispatch target is completed post-dispatch interval by AEMO. Dispatch conformance is the process by which AEMO identifies if an Aggregator fails to follow or meet the dispatch target.

Please refer to the SO_OP_3705-Dispatch standard operating procedure available at AEMO website[4] for additional back ground information on Dispatch Conformance monitoring and assessment.

5.1 Dispatch Instructions for Wholesale Energy

Item	Description	Energy
Publication Frequency	The frequency of publication of dispatch instructions	Every 5 mins
Time lag	Time it takes to publish and send dispatch instructions to the aggregator	Published after start of dispatch interval (~ 10-15 seconds)
Dispatch Target	The amount aggregator must generate or consume to meet the dispatch target.	Absolute value

5.2 Dispatch Instructions Characteristics

Dataset Name	Dispatch Instructions
Description	Dispatch Instructions are issued by AEMO to Aggregators for the purpose of meeting the supply and demand balance in EDGE. By either generating i.e. export to grid or by consuming i.e. import from grid. AEMO will send out dispatch instructions every 5 mins to Aggregators participating in Project EDGE.
Information Classification	Confidential
Publication Frequency	Every 5 mins
Data Volume	Low

[4] https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/power_system_ops/procedures/so_op_3705-dispatch.pdf?la=en

Dataset Name	Dispatch Instructions
Max No of records	1 row per Aggregator per dispatch interval
Data Submission	• Dispatch Instructions are generated and sent by AEMO to Aggregators. – Aggregator on receipt of the Dispatch Instructions will send acknowledgement of successful receipt to AEMO • AEMO will send the dispatch instructions to DNSP as FYI only
Initiating Participant	AEMO
Recipient Participant	1. Aggregator 2. DNSP
Submission Acknowledgement	• AEMO expects acknowledgements of successful receipt of dispatch instruction from Aggregator. • No acknowledgement of delivery of services is required as part of Dispatch.

5.3 Dispatch Instruction Data Definition

ID	Attribute	Business Name	Date Type	**Description**	**Is Mandatory**	**Is Nullable**	**Comments/ Validation Rule**
1	dispatchDateTime	Dispatch Date Time	DateTime	This refers to the dispatch interval (DI) end time for which the dispatch target is provided.	Y	N	• Provided in NEM time • Format: yyyy-mm-ddThh:mm:ss+10:00
2	duid	DUID	String	Dispatchable Unit Identifier. This is used by EDGE marketplace to generate dispatch instruct for. This represents the system aggregation point of Aggregator portfolio.	Y	N	• 8 digit alphanumeric • Min length = 8 • Max length = 8 • Universally unique
3	totalCleared	Total Cleared Amount	Number	Total amount in 'kW' cleared for dispatch. This refers to the absolute amount that the DUID should reach by end of DI. • A '+ve' value refers to generation target • A '-ve' value refers to load target	Y	N	Decimal (8,3)
4	rrp	Dispatch Price	Number	This refers to the 5 min spot price. For EDGE this is the regional reference price for Victoria	Y	N	$/MWh, regional ref price Decimal (6,2)
5	offerTradingdate	Processed Boffer Trading Date	Integer	Trading day of the Boffer used for market clearing (or solving market)	Y	N	• Valid date • Format: yyyy-mm-dd
6	offersubmissionDatetime	Processed Boffer Submission Datetime	Datetime	This refers to the submission Datetime of the Boffer used for clearing the market (i.e. generating dispatch targets for Aggregator)	Y	N	• Provided in NEM time • Format: yyyy-mm-ddThh:mm:ss+10:00

6. DUID Telemetry Data

DUID Telemetry data is also referred as DUID level Operational data. This data refers to the actual measurement at the DUID level are instantaneous measurements. DUID Telemetry data is provided after the fact by the Aggregator to AEMO for the purpose of dispatch target conformance monitoring following local network and wholesale services provision.

For additional details on the DUID Telemetry Data please refer to the 'Project EDGE: DUID Telemetry Overview' available at https://aemo.com.au/-/media/files/initiatives/der/2021/edge-duid-telemetry-overview.pdf?la=en

Please note: DUID represents the Aggregators whole portfolio. DUID is the aggregation of all DER assets enrolled in the Project EDGE for a particular Aggregator.

6.1 DUID Telemetry Data

Item	Description	**Step 1: Once a day data submission**	**Step 2: Near Realtime data submission**
Operational data usage	What is the purpose of the Aggregated Operational data?	• Aggregated Operational data is used to assess Aggregator's conformance to wholesale energy dispatch target. • This assessment is done post-dispatch interval.	• Aggregated Operational data is used to assess Aggregator's conformance to wholesale energy dispatch target. • This assessment is done post-dispatch interval.
Power Type	The power type that will be the subject of wholesale energy compliance assessment	• Active power in kW measured as net NMI flow • Active power in kW measured at common measurement point for flexible DER capacity only	• Active power in kW measured as net NMI flow • Active power in kW measured at common measurement point for flexible DER capacity only
Data aggregation	The level of aggregation required for operational data	Aggregated at DUID (representing the aggregators portfolio)	Aggregated at DUID (representing the aggregators portfolio)
Data Granularity	The resolution or the temporal qualification of the data captured	1 min	1 min
Submission Frequency	The frequency of Aggregator submission of operational data to AEMO	Daily (once a day submission)	1 min

6.2 DUID Telemetry Data Characteristics

Dataset Name	DUID Telemetry
Description	DUID Telemetry or Aggregated DUID level DER Operational data is provided by Aggregator to AEMO. The data is measured at 1 minute resolution (instantaneous measurement) and provided to AEMO for the purpose of Dispatch Conformance monitoring.
Information Classification	Confidential
Publication Frequency	• Step 1: Once a day; after the fact data submission • Step 2: On-going real time data submission at 1 min frequency
No of records	• Step 1: 1,400 records (resulting from data measured at 1 minute resolution – active power flow at DUID) • Step 2: tbc based on submission methodology
Data Submission	• Aggregated DUID level Telemetry data is submitted by Aggregator to AEMO • AEMO on receipt of the data will – Acknowledge the data submission – Preform the dispatch conformance monitoring
Initiating Participant	Aggregator
Recipient Participant	AEMO
Submission Acknowledgement	The Aggregator should expect one acknowledgement from AEMO. • A System Acknowledgement: indicating successful/ failed data submission to AEMO. Aggregator will be provided with a 'msg-ID#' and response message.

6.3 DUID Telemetry Data Definition

The Data is provided for the whole of Aggregator portfolio.

ID	Attribute	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
1	duid	DUID	String	Dispatchable Unit Identifier. This is used by EDGE marketplace to generate dispatch instruct for. This represents the system aggregation point of Aggregator portfolio.	Y	N	• 8 digit alphanumeric • Min length = 8 • Max length = 8 • Universally unique
2	duidTelemetryIntervals		Array	An Array of measurement time and measurements			
2.1	measurementDatetime	Measurement Date Time	datetime	This specifies the measurement time of observations in NEM time	Y	N	• Provided in NEM time • Format: yyyy-mm-ddThh:mm:ss+10:00
2.2	activePower	Active Power	Number	Instantaneous measurement of the Active Power (in kW) exported to grid or imported from grid within a dispatch interval. Active power is measured at: • In case of 'NMI' measured at connection point • in case of 'Flex' measured at a 'common measurement point' and then aggregated to DUID level. This represents portfolio's active power import/export (single value) to market at specified time (kW)	Y	N	
2.3	controlledGeneration	Actual Controlled Generation	Number	Actual Controlled generation in kW: Instantaneous measurement of the sum of actual discharge/generation activity of the DUID.	Y	N	Value >= 0

ID	Attribute	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
				Note: this is not intended to include uncontrolled generation such as uncontrolled PV that is not being actively controlled **A positive value indicates generation (discharging).**			
2.4	controlledLoad	Actual Controlled Load	Number	Actual Controlled load in kW: Instantaneous measurement of 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 **A negative value indicates load (charging).**	Y	N	Value <= 0
2.5	energyStored	Actual Energy Stored	Number	Instantaneous measurement of the Actual Energy in kWh that is stored in the Aggregator's portfolio that could have been discharged if required.	Y	N	
3	submissionDatetime	Submission Date time	datetime	Specifies the date/time of record creation	N	Y	• Provided in NEM time • Format: yyyy-mm-ddThh:mm:ss+10:00

6.4 DUID Telemetry Data Validation Rules

Attribute Name	Validation Rule
activePower	The active power flow is less than either • Maximum Generation Capacity or • Maximum Load Capacity

7. Availability Forecast

Availability Forecast represents the available capacity of generation or load in each Aggregators portfolio. The Availability forecast is exclusive of charge and discharge expectations of the storage systems, this only reflects the total online capability.

For additional details on the DUID Telemetry Data please refer to the Section 2: Availability Forecast of the 'Project EDGE: DUID Telemetry and Availability Forecast requirements[5]' available at

7.1 Availability Forecast Data

Item	Description	Availability Forecast
Operational data usage	What is the purpose of the Availability Forecast data?	To provide visibility of the aggregator portfolio free of any commitments.
Data aggregation	The level of aggregation required for operational data	DUID
Data Granularity	The resolution or the temporal qualification of the data captured	• 5 min: 5-minute resolution covering 48 hrs • 30 min: 30-minute resolution covering the ST PASA timeframe (192 hrs)
Submission Frequency	The frequency of Aggregator submission of operational data to AEMO	• 5 min for 5 min sampling rate • 30 min for 30 min sampling rate

7.2 Availability Forecast Data Characteristics

Dataset Name	**Availability Forecast**
Description	Availability Forecast represents the available capacity of generation or load in each Aggregators portfolio. The Availability forecast is exclusive of charge and discharge expectations of the storage systems, this only reflects the total online capability.
Information Classification	Confidential
Publication Frequency	Every 5 mins
No of records	576 records representing all 5 min intervals in 48 hrs

[5] https://aemo.com.au/-/media/files/initiatives/der/2021/edge-duid-telemetry-overview.pdf?la=en

Dataset Name	**Availability Forecast**
Data Submission	• Availability Forecast data is submitted by Aggregator to AEMO • AEMO on receipt of the data will – Acknowledge the data submission
Initiating Participant	Aggregator
Recipient Participant	AEMO
Submission Acknowledgement	The Aggregator should expect one acknowledgement from AEMO. • A System Acknowledgement: indicating successful/ failed data submission to AEMO. Aggregator will be provided with a 'msg-ID#' and response message.

7.3 Availability Forecast Data Definition

ID	Attribute	Business Name	Data Type	**Description**	**Is Mandatory**	**Is Nullable**	**Comments/ Validation Rule**
1	duid	DUID	String	Dispatchable Unit Identifier. This is used by EDGE marketplace to generate dispatch instruct for. This represents the system aggregation point of Aggregator portfolio.	Y	N	• 8 digit alphanumeric • Min length = 8 • Max length = 8 • Universally unique
2	measurementPoint	Measurement Point	String	Identifies the measurement point to indicate the defintion of quantity. • Net NMI – refers to the net connection point flow • Flex – refers to aggregated controllable generation and/ or load at a site.	Y	N	
3	duidTelemetryIntervals		Array	An Array of measurement time and measurements			
3.1	measurementDatetime	Measurement Date Time	datetime	This specifies the measurement time of observations	Y	N	• Provided in NEM time • Format: yyyy-mm-ddThh:mm:ss+10:00
3.2	availFcstGenCap	Availability Forecast Generation Capacity	Number	The level of total generation that could be created (kW) if the Aggregator discharged at the maximum rate.	Y	N	

ID	Attribute	Business Name	Data Type	**Description**	**Is Mandatory**	**Is Nullable**	**Comments/ Validation Rule**
3.3	availFcstLoadCap	Availability Forecast Load Capacity	Number	The level of total load that could be created (kW) if the Aggregator charges storage at the maximum rate.	Y	N	
3.4	availFcstEnergyStorageCap	Availability Forecast Energy Storage Capacity	Number	Forecast energy storage capacity of the Aggregator in kWh	Y	N	
4	samplingRate	Sampling Rate	String	Sampling rate of the Availability Forecast in mins 5min, 30min			
5	submissionDatetime	Submission Date time	datetime	Specifies the date/time of record creation	N	Y	• Provided in NEM time • Format: yyyy-mm-ddThh:mm:ss+10:00

8. Pre-dispatch Price Forecast

As a design principle, Project EDGE aligns as closely as possible to current NEM rules. In line with current NEM market operations, aggregators participating in Project EDGE field trials will receive pre-dispatch price forecasts through the off market DER Marketplace.

Pre-dispatch (PD) price forecast provides market participants with forecasted regional reference price (e.g for VIC) at a 5-minute resolution for the next hour and at 30-minute resolution for the period covering up to the end of the next trading day at the time of publication.

The 5 min resolution forecast is referred at P5min forecast, and 30 min resolution forecast commonly referred to as PD forecast. The PD forecast covers to the end of the next trading day in 30-minute increments.

As a general guide, P5min forecast is published ~ 40 seconds into the dispatch interval and contains a forecast for 12 dispatch intervals. The first interval contains the actual spot price for that dispatch interval and the remaining 11 intervals are the forecasted regional reference price

8.1 Pre-dispatch Forecast Data

Item	Description	Availability Forecast
Operational data usage	What is the purpose of the Pre-dispatch price forecast data?	To provide visibility of the forecasted regional reference price at 5 min resolution and at 30 min resolution as a consideration and input to Aggregator Boffer computation.
Data aggregation	The level of aggregation required for operational data	The data is provided for the NEM Region.
Data Granularity	The resolution or the temporal qualification of the data captured	• 5 min: 5-minute resolution covering 1 hr from time of publication • 30 min: 30-minute resolution covering the pre dispatch time frame
Publication Frequency	The frequency of publication of the pre dispatch price forecast	• Every5 mins for P5 min forecast (contains data at 5-minute interval)

Item	Description	Availability Forecast
		• Every 30 mins for PD price forecast (contains data at 30 min sampling rate)

8.2 Pre dispatch price Forecast Data Characteristics

Dataset Name	**Pre-dispatch Price Forecast**
Description	Pre-dispatch price forecast is published in two resolutions • 5 min provided for next hour • 30 min provided till end of the next trading day Pre-dispatch price forecast represents the forecasted regional reference price for each dispatch interval for the next hour and forecasted regional reference price at 30 min intervals. The prices in the 30 min forecast is average of the 5 min dispatch price; thus this provides indication of 5 min regional reference price till end of next trading day.
Information Classification	Public
Publication Frequency	• Every 5 mins • Every 30 mins
No of records	For 5 min forecast – 12 records
Data Publication	PD forecast is published by AEMO to Aggregator
Initiating Participant	AEMO
Recipient Participant	Aggregator(s)

8.3 Pre-dispatch (PD) Price Forecast Data Definition

ID	Attribute	Business Name	Data Type	**Description**	**Is Mandatory**	**Is Nullable**	**Comments/ Validation Rule**
1	priceType	Price Type	String	Specify if it's a pre dispatch forecast price or actual price (5 min clearing price	Y	N	
2	sourceFileName	Source File Name	String	Source File Name	Y	N	
3	intervalLength	Interval Length	String	This specifies the Data granularity - 5 min or 30 mins			
4	pricingIntervals[]	Pricing Intervals	Array	Array to capture data for forecast time horizon	Y	N	
4.1	pricingIntervals[].intervalEndTime	Interval End Time	String with 'date-time'	End time of the dispatch interval	Y	N	
4.2	picingIntervals[].source	Source	String	Defines the source of the price forecast or the actual price data Actual = Data generated by NEM market System Simulated = data prepared by Analyst	Y	N	
4.3	pricingIntervals[].price	Price	Number	forecasted Regional Reference price.	Y	N	
4.4	pricingIntervals[].region	Region	String	Refers to the region for which the forecast price is provided	N	N	

ID	Attribute	Business Name	Data Type	**Description**	**Is Mandatory**	**Is Nullable**	**Comments/ Validation Rule**
4.5	PricingIntervals[].createdDttm	Created Date time	String with format 'date-time'	Specifies the date/time of forecast creation	Y	N	•
4.6	pricingIntervals[].intervention	Intervention	Number	Specify if an intervention was made.	Y	N	•